

ATSUGI

SPECIFICATIONS
FOR
RENOVATION OF HANGAR
AT

ATSUGI NAVAL AIR STATION

STATINTL

PREPARED BY

STATINTL

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FOR
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KANAGAWA, JAPAN

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PART I - STATEMENT OF WORKSW-1. DESCRIPTION OF WORK:

a. Work to be done. The work consists of furnishing all plant, labor, materials, and equipment and performing all work in strict accordance with these specifications and schedules and drawings forming parts thereof for the Renovation of Hangar at Atsugi Naval Air Station.

b. Location. The work is located at Atsugi Naval Air Station, Kanagawa, Japan.

SW-2. PRINCIPAL FEATURES: The project includes the following principal features:

- a. Add new partitions, reconstruct and rearrange existing partitions.
- b. Provide acoustical and thermal insulation.
- c. Install asphalt tile flooring.
- d. Repaint interior of building.
- e. Construct bins, counters and racks.
- f. Install security bars on all exterior windows.
- g. Install lighting fixtures and special purpose outlets.
- h. Provide heating in hangar area.
- i. Install air-conditioning equipment in new equipment room.
- j. Construct concrete pads for electric generators, transformers and frequency converters.
- k. Construct security fencing and install floodlights.
- l. Construct jet blast deflectors at existing hardstand in front of hangar area.
- m. Install underground storage tank for generator fuel.

PART II - SPECIAL CONDITIONS

SC-1. COMMENCEMENT, AND COMPLETION OF WORK: The contractor will be required to commence work under this contract within two (2) calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to complete the entire work ready for use not later than thirty (30) calendar days after the date of receipt of notice to proceed. The time stated for completion shall include final clean-up of the premises.

SC-2. DRAWINGS: Five (5) sets of contract drawings and specifications will be furnished the contractor without charge. Additional sets will be furnished on the request at the cost of reproduction. The work shall conform to the following drawings, all of which form a part of this specification, and are available in the Office of the Director Facilities Support.

<u>Drawing No.</u>	<u>Sheet No.</u>	<u>Rev.</u>	<u>Date of Dwg. or Last Rev.</u>	<u>Title</u>
	A-1		18 Dec. 1956	Location & Floor Plan
	A-2		18 Dec. 1956	Detail Plan I & Details
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	A-4		18 Dec. 1956	Finish Schedule Door & Window Schedule Security Fence Plan & Details
	M-1		18 Dec. 1956	Air Conditioning, Heating & Ventilating - Floor Plan & Details
	M-2		18 Dec. 1956	Air Conditioning & Ventilating Details
	M-3		18 Dec. 1956	Plumbing & Compressed Air Supply Floor Plan & Details
	E-1		18 Dec. 1956	Lighting Plan
	E-2		18 Dec. 1956	Power Plan (Part I)
	E-3		18 Dec. 1956	Power Plan (Part II)
	E-4		18 Dec. 1956	Lighting Fixtures, Symbols, Etc.
	E-5		18 Dec. 1956	Miscellaneous Plans & Details
	E-6		18 Dec. 1956	Panel Board Details

SC-3. GOVERNMENT FURNISHED MATERIALS: The Government will furnish to the contractor the items as listed by the Contracting Officer.

SC-3A. CONTRACTOR FURNISHED PROPERTY:

a. The contractor will furnish all the materials necessary to complete the work under this contract.

b. The contractor will furnish all the construction equipment and vehicles of the character and in the amount necessary to complete the work under this contract within the specified time.

c. The contractor will furnish the lumber for plant facilities and materials required for the constructions of temporary buildings.

SC-3B. CONTRACTOR'S CAMP SITE: The contractor shall be responsible for arranging with the landowners for the location of its camp, shall pay all charges involved, and shall bear all the expense of developing its camp site. The Government will not be responsible in any manner for furnishing such camp site.

SC-4. WATER: The responsibility shall be upon the contractor to provide and maintain, at his own expense, an adequate supply for his use for constructing and domestic consumption, and to install and maintain necessary supply connections and piping for same, but only at such locations and in such manner as may be approved by the Contracting Officer. All water shall be carefully conserved. Before final acceptance, temporary connections and piping installed by the contractor shall be removed in a manner satisfactory to the Contracting Officer.

SC-5. ELECTRICITY: All electric current required by the contractor shall be furnished at his expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. In the event electricity is made available by the Government, the contractor shall, at his own expense, install a meter to determine the amount of current used by him, and such electricity will be paid for by or charged to the contract at prevailing rates or at reasonable rates as determined by the Contracting Officer. All temporary lines will be furnished, installed, connected and maintained by the contractor in a workmanlike manner satisfactory to the Contracting Officer, and shall be removed by the contractor in like manner at his expense prior to completion of the construction.

SC-6. RATES OF WAGES: Wage and hour and other laws and regulations when applicable, pertaining to the employment of labor prescribed by the Japanese Government, the government exercising jurisdiction where the work is being performed, shall be observed by the contractor and all subcontractors for the duration of this contract.

SC-7. BONDS: No payment or performance bond will be required.

SC-8. EMERGENCY LIGHTING AND SIGNALS REQUIRED ON AIRFIELD CONSTRUCTION AND ELIMINATION OF HAZARDS: The operation of all ground equipment, mobile or stationary, required for construction, repairs or any other purpose within the landing areas of all airdromes, shall be governed by the following regulations.

Definition: The term "landing areas" shall include all runways and taxiways, plus 75 feet on each side and a zone 1000 feet long at each end of each runway, or to within 50 feet of the boundary

of the airport. On all other landing fields, the entire area available for landing and taxiwaying of aircraft is included in this term.

a. Landing areas, hazardous to aircraft, shall be outlined by yellow flags by day and red lanterns by night, except that where contact lights outline the runway, no red lanterns shall be placed on obstructions outside the contact light area.

b. In the landing area, during daylight hours, all equipment shall be marked with international orange and white checkered flags, and materials with yellow flags. At night, equipment and materials shall be marked with red lanterns, except that where contact lights outline the runway, no red lanterns shall be placed on obstructions outside the contact light area.

c. Nothing shall be placed upon a landing area without authority of the Contracting Officer.

d. Neither equipment nor personnel shall use any runway for any purpose other than aircraft unless the runway is closed by order of the Contracting Officer, marked as indicated above.

e. The contractor shall report to the Contracting Officer before initiating any work and shall notify the Contracting Officer of proposed changes of locations of operations. At all airdromes where flying is controlled, additional permission must, in each and every instance, be obtained from the control tower operator before entering a landing area unless such area is marked as hazardous to aircraft as indicated in (a) above.

f. Work will be carried on in such a manner as to leave the portion of the landing area, which is available to aircraft, free from hazards at all times. There shall be no ruts, holes, material piles, or projecting shoulders which might damage an airplane tire. Paved surfaces, such as runways, taxiways and hardstands, shall be kept clean at all times and specifically must be kept free from all small stones, which might damage propellers. No separate payment will be made for this lighting and protection; all costs in connection therewith shall be included in the cost of the work.

SC-9. SHOP DRAWINGS: The contractor shall submit to the Contracting Officer for approval six (6) copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete and shall contain all required detailed information. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Five (5) sets of all shop drawings will be retained by the Contracting Officer and one (1) set will be returned to the contractor.

The approval of the drawings by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any error which may exist, as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work.

SC-10. LIQUIDATED DAMAGES: No liquidated damages will be assessed.

SC-11. LAYOUT OF WORK: The contractor shall lay out the work from a base line and from a bench mark established by the Government. The contractor shall furnish without cost to the Government all stakes, templates, platforms, ranges, equipment, tools and materials, and all labor required in setting or cutting or laying out the work, including measurements and computations, and shall be responsible for the proper execution of the work to the Government established line and grade as shown on the drawings specified in the attached Technical Provisions or fixed by the Contracting Officer at the project site. All stakes and other marks established by the Government shall be preserved by the contractor until their removal is authorized by the Contracting Officer.

SC-12. QUALITY OF ARTICLES, MATERIALS AND EQUIPMENT:

a. Articles, materials and equipment to be incorporated into the work under this contract shall be new and unused unless otherwise specified.

b. Unless otherwise specified or approved, materials and equipment which are specified to conform to the requirements of Government specifications or standards, shall also conform to the amendments thereto in effect on date of issue of the Invitation for Quotations.

SC-13. SECURITY REQUIREMENTS: The contractor shall comply with all rules and regulations of the Military Installation where the work is to be performed, including proper identification of personnel and the use of vehicles and equipment; and shall use only such roads, parking areas and storage areas as are designated by the Contracting Officer.

SC-14. RECORD DRAWINGS: During performance of work under this contract, the contractor shall accurately record and delineate on one (1) set of Ozalid transparencies of contract drawings (which will be furnished to him by the Government) all changes in such work, which constitute departures from the original contract drawings. The set of drawings thus corrected and changed, usually referred to as "as-built" drawings shall show the work as actually constructed. Such set of "as-built" drawings shall be delivered to the Contracting Officer at the earliest practical date prior to completion of all work under the contract, in any event not later than the date of acceptance of the completed work by the Government.

PART III - TECHNICAL PROVISIONS

SECTION 1. EXCAVATION, FILLING, AND BACKFILLING

1-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials not furnished by the Government, and in performing all operations in connection with the excavation, filling, and backfilling, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

1-02. WORK NOT INCLUDED: Excavation, filling, and grading for roads, parking areas, sidewalks, aprons, drainage and other subsurface utilities systems, and excavation for the building utilities beyond a point 5 feet outside the building line are not included under this section of the specifications except as otherwise specified.

1-03. EXCAVATION:

a. General. The site indicated on the drawings shall be cleared of all natural obstructions including clearing and grubbing and existing foundations, pavements, utility lines, and other items which will interfere with the construction operations. The excavation shall conform to the dimensions and elevations indicated on the drawings for the building. In conditions where suitable bearings are encountered at different elevations from those indicated on the drawings, the Contracting Officer may direct in writing that the excavation be carried to elevations above or below those indicated on the drawings. Unless so directed by the Contracting Officer, excavation shall not be carried below the elevation indicated on the drawings. Where the excavation is made below the elevations indicated on the drawings or directed by the Contracting Officer, the excavation, if under slabs, shall be restored to the proper elevation in accordance with the procedure herein-after specified for backfill, or if under footings, the heights of the walls or footing shall be increased, as may be directed by the Contracting Officer. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against excavated surfaces. Undercutting will not be permitted. Topsoil, and suitable excavated material which is required for fill under slabs, shall be separately stockpiled as directed by the Contracting Officer.

b. Drainage in Vicinity of Buildings and Other Structures: The contractor shall control the grading in the vicinity of buildings and other structures so that the surface of the ground will be properly sloped to prevent water from running into the excavated areas. Any water which accumulates in the excavation shall be removed promptly.

c. Shoring. Such shoring, including sheet piling, as may be required during excavation shall be installed to protect the banks, adjacent paving, structures, and utilities.

d. Excess Material. Excess material from excavation, not required for fill or backfill, shall be wasted where directed by the Contracting Officer. Wasted material shall be spread and leveled or graded, as directed by the Contracting Officer.

e. Removal of Utilities. When utility lines are encountered within the area of operations, the contractor shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of the service.

1-04. FILLING: Where concrete slabs are placed on earth, all loam and organic or other undesirable material as determined by the Contracting Officer, shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the drawings or as required by the Contracting Officer, such fill shall consist of broken stone, sand, gravel, or other material approved by the Contracting Officer. Where broken stone, sand, or gravel, is used for fill, it shall be placed in layers not exceeding 12 inches in thickness and thoroughly compacted with a roller of a type approved by the Contracting Officer. When earth is used for fill, it shall be placed in layers not exceeding 8 inches in thickness. Each layer shall be moistened during compaction to a moisture content such that the required degree of compaction may be obtained. Compaction shall be in a manner approved by the Contracting Officer, to a density of not less than 95 percent of its maximum density.

1-05. BACKFILLING: After completion of foundation footings and walls, piling, and other construction below the elevation of the final grades, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of the excavation, or borrow of sand, gravel or other materials approved by the Contracting Officer, and shall be free of trash, lumber, or other debris. Backfill shall be placed in horizontal layers not in excess of 9 inches in thickness, and shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by hand or machine tampers or by other suitable equipment to a density that will prevent excessive settlement or shrinkage. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage of the backfill. Backfill under slabs or footings shall be placed in accordance with the requirements of Paragraph 1-04.

1-06. GRADING: Necessary grading in the vicinity of the building shall be accomplished to the elevations indicated on the plans and shall be such as to provide proper drainage away from the building. Embankments shall be compacted to 90% maximum density, except that the top 8 inches of areas to be surfaced shall be compacted to 95% maximum density described in Paragraph 1-04.

SECTION 2. DISMANTLING AND SALVAGE

2-01. SCOPE: The work covered by this section of the specifications consists in furnishing all labor, equipment, and materials, and in performing all operations in connection with the dismantling and salvaging of buildings, structures and utilities, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

2-02. GENERAL: All Government properties which are to be dismantled or salvaged shall be carefully executed and stored in such manner and place as directed by the Contracting Officer.

2-03. DISCONNECTION OF SERVICES: When it is necessary to cut off water service in the mains for any purpose, prior permission of the Contracting Officer shall be obtained in writing. During such times as it becomes necessary to have the water service cut off in any area, adequate precaution shall be taken to insure maximum fire protection for that area.

2-04. DISMANTLING:

a. Schedule of work. Work shall be started and completed in order of precedence as established by a schedule of work, approved by the Contracting Officer, and prepared before any work is begun.

b. Structures. Provisions, approved by the Contracting Officer, shall be made to avoid interference with the use of adjoining buildings or the interruption of free passage thereto. Operational procedures and sequences for dismantling shall be optional with the contractor insofar as they do not infringe on the work schedule approved by the Contracting Officer or the salvage requirements. The sequence of operations shall be such as to afford maximum practicable protection from inclement weather to materials in partially dismantled structures, and to provide safe working conditions. Operations, unless directed otherwise by the Contracting Officer, shall be designed to produce a maximum amount of salvage with a minimum of scrap.

c. Defective construction. Any construction and structural timber framing members shall be carefully inspected and all existing defective members shall be restored, spliced if allowable, or replaced to meet the original strength of the member at the direction of the Contracting Officer.

d. Burning of materials and debris. No materials or debris shall be burned on the premises except under such provisions and in such manner as specifically approved by the Contracting Officer.

-05. PREPARATION FOR DISPOSITION: Salvaged materials shall be prepared for disposition by stacking, bundling, crating, packaging, and shall be provided with skids, all as required by the Contracting Officer.

-06. DISPOSITION: Dismantled material and equipment shall be salvaged and prepared for disposition, and delivered to the designated storage area as directed by the Contracting Officer.

-07. CLEANING UP: Material designated for scrap shall be disposed of as designated by the Contracting Officer. When scrap is burned, proper precautions and provisions shall be effected for the protection of property from effects of the fire. The burned over area shall be raked clean and any unburned debris shall be disposed of as fill or as otherwise directed by the Contracting Officer.

SECTION 3. CONCRETE

3-01. SCOPE: The work covered by this section of specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the installation of concrete work, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

3-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U.S. Federal Specifications and equipment Japanese Industrial Standards and in each case that specification requiring the higher standard of appearance, quality and performance shall govern.

a. U.S. Federal Specifications.

b. Japanese Industrial Standards.

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
HH-F-334	-----	Filler, Expansion-Joint
QQ-B-71	G-3110	Bars, Reinforcement
SS-C-192	R-5210	Cement, Portland
SS-A-281	-----	Aggregate, for Concrete
-----	A-1101	Method of Slump Test
-----	A-1102	Sieve Analysis of Aggregates
-----	A-1105	Organic Impurities in Sand
-----	A-1106	Flexural Strength of Concrete

c. American Society for Testing Materials Standards.

A 185	Welded Steel Wire Fabric for Concrete Reinforcement.
A 82	Cold-Drawn Steel Wire for Concrete Reinforcement.
C 143	Slump Test for Consistency of Concrete.
C 39	Test for Compressive Strength of Concrete Cylinders.
C 156	Test for Water Retention Efficiency of Methods for Curing Concrete.
C 713	Test for Air Content of Freshly Mixed Concrete.

3-03. GENERAL: Full cooperation shall be given other trades to install embedded items. Suitable templates or instructions, or both, will be provided for setting items not placed in the forms. Embedded

items shall have been inspected, and tests for concrete and other materials or for mechanical operations shall have been completed and approved, before concrete is placed.

3-04. MATERIALS:

a. Aggregate. Coarse and fine aggregate shall consist of crushed limestone and screenings, or other approved granular materials of similar characteristics, and shall be composed of hard, tough, durable and uncoated particles. The equipment and plant used in the production of coarse and fine aggregate shall be designed for the aggregate conforming with the requirements of these specifications. Dust shall be removed by adequate washing. The particle shape of the smallest size of crushed coarse and fine aggregate shall be generally rounded or cubical, and the tolerance of flat and elongated particles in all sizes of the coarse and fine aggregate shall be governed by the inherent placeability requirements of the structure in which the mixture is to be placed. Rock which breaks down into thin, flat, elongated particles, regardless of the type of processing equipment used, will not be approved for use in the production of coarse and fine aggregate. A thin, flat and elongated particle is defined as a particle having a maximum dimension greater than five (5) times the minimum dimensions. Aggregate shall not be manufactured from rock which is subject to weathering or disintegration when exposed to air or moisture nor from rock containing opaline or other active minerals.

(1) Coarse Aggregate. Coarse aggregate shall consist of clean, hard, washed stream or river gravel, or crushed stone, and shall be hard, sound, of durable particles, free from dirt, silt, clay, or organic matter. The deleterious substances designated shall not be present in excess of the following:

	<u>Percent by weight</u>
Soft fragments	2.0
Clay lumps	0.25
Coal and lignite	0.25
Material finer than the No. 200 sieve (JIS 0.075 mm)	1.0
Other deleterious substances (such as alkali and decayed, friable, thin, elongated, laminated, or honeycombed pieces)	3.0

Grading of coarse aggregate shall conform to the following requirements:

<u>Total passing</u>	<u>Percent by weight</u>
Sieve 1-1/2 in (JIS 40 mm)	100
" 1 in (JIS 25 mm)	90 - 100
" 1/2 in (JIS 15 mm)	25 - 60
" No. 4 (JIS 5 mm)	0 - 10

(2) Fine aggregate. Fine aggregate shall be river washed sand consisting of uniformly graded particles of clear, hard, sharp mineral aggregate, free from dirt, silt, clay, or organic matter. The deleterious substances designated shall not be present in excess of the following amounts:

	<u>Percent by weight</u>
Clay lumps	1.0
Coal and lignite	0.25
Material finer than the No. 200 sieve (JIS 0.075 mm)	3.0

Grading of fine aggregate, except as modified hereinafter, shall conform to the following requirements:

<u>Total passing</u>	<u>Percent by weight</u>
Sieve No. 4 (JIS 5 mm)	95 - 100
" 16 (JIS 1.2 mm)	45 - 80
" 50 (JIS 0.3 mm)	5 - 30
" 100 (JIS 0.15mm)	0 - 8

b. Cement. Only one brand of cement shall be used for exposed concrete in any individual structure. Cement reclaimed from cleaning bags or leaking containers shall not be used. Cement shall be used in the sequence of receipt of shipment, unless otherwise directed. Portland cement shall conform to JIS R-5210.

c. Curing materials.

- (1) Waterproof paper. JIS A-6001.
- (2) Mats. Commercial quality of type used for purpose.
- (3) Burlap. Commercial quality.

d. Drainage fill under concrete floor slabs and elsewhere required shall be porous, free-draining material such as broken stone, gravel, cinders, or sand.

e. Expansion joints.

(1) Premolded expansion-joint filler strips. These shall be of premolded asphalt composition, with a melting point of not less than 110° C, a penetration of 25° (1° - 1/10 mm) at 25° C, and a recovery at 25° C of not less than 70 percent in an hour's time after the specimen is compressed to 50 percent of its original thickness. Material shall be equal to expansion joint fillers as manufactured by Nisshin Kogyo K.K., Nihon Rekisei Kogyo K.K. or other approved manufacturer.

(2) Expansion joint compound. Expansion joint compound shall be as manufactured by Nisshin Kohgyo K.K., Nihon Rekisei Kogyo K.K., or an approved equal.

f. Forms. Wood forms shall be used unless otherwise specified by the Contracting Officer.

g. Reinforcement.

(1) Bars. Reinforcing bars shall be intermediate grade, new billet steel reinforcing bars, conforming to JIS G-3110, SSD-39 or SSD-49, as required by the drawings. Reinforcing steel shall be free from rust, scale, grease, or other coatings that would destroy the bond. Reinforcement reduced in section by rusting shall not be used.

(2) Mesh Reinforcement. ASTM Standard A 185, except as specified otherwise hereinafter. When indicated in slabs on fill mesh shall be of the sizes indicated, and gage shall be American steel wire gage.

h. Water shall be clean and free from injurious amounts of oils, acids, salts, alkalies, organic matter, or other deleterious substances.

05. SAMPLES AND TESTING:

a. General. Testing of the aggregate, reinforcement, cement and end items shall be the responsibility of the Government. Samples of concrete for strength tests of end items shall be provided and stored by the contractor when and as directed.

b. Cement shall be tested as prescribed in JIS R-5201, 5202, 5203 and 5210, and shall be sampled either at the mill or at the site of the work. Tests will be made by or under the supervision of the Contracting Officer, at the expense of the Government. No cement shall be used until notice has been given by the Contracting Officer that the test results are satisfactory. Cement which has been stored, other than in the bins at the mills, for more than 4 months after being tested shall be retested before use. Ordinarily, no cement shall be used until it has satisfactorily passed both the 7- and 28-day tests; but in cases of urgency the Contracting Officer may waive the 28-day tests and permit the use of cement which has satisfactorily passed the chemical, soundness, and 7-day tests, provided it is the product of a quarry and mill which have established a reputation of not less than 3 years' standing for the production of high-grade cement. Any cement delivered at the site of the work and later found under test to be unsuitable shall be removed from the work and its vicinity.

c. Aggregate shall be tested as prescribed in Federal Specification SS-A-281. In addition, fine aggregate shall be tested for organic impurities in conformance with ASTM Standard C 40.

3-06. STORAGE accommodations shall be subject to approval and shall afford easy access for inspection and identification of each shipment in accordance with test reports.

a. Cement. Immediately upon receipt at the site of work, cement shall be stored in a dry, weathertight, properly ventilated structure, with adequate provision for prevention of absorption of moisture.

b. Aggregate. Storage piles of aggregate shall afford good drainage, preclude inclusion of foreign matter and preserve the gradation. Sufficient live storage shall be maintained to permit segregation of successive shipments, placement of concrete at required rate, and such procedures as heating, inspection and testing.

3-07. FORMS, complete with centering, cores and molds shall be constructed to conform to shape, form, line and grade required, and shall be maintained sufficiently rigid to prevent deformation under load. Where hardboard forms are used, studs shall be spaced sufficiently close to prevent deflection of hardboard and consequent waviness in surfaces of concrete.

a. Design. Joints shall be leakproof and shall be arranged vertically or horizontally to conform to the pattern of the design. Forms placed on successive units for continuous surfaces shall be fitted to accurate alinement to assure a smooth completed surface free from irregularities. In long spans, where intermediate supports are not possible, the anticipated deflection in the forms due to weight of fresh concrete shall be accurately figured and taken into account in the design of the forms, so that finished concrete members will have true surfaces conforming accurately to desired lines, planes and elevations. If adequate foundation for shores cannot be secured, trussed supports shall be provided. Temporary openings shall be arranged in wall and column forms and where otherwise required, to facilitate cleaning and inspection. Lumber once used in forms shall have nails withdrawn and surfaces to be exposed to concrete carefully cleaned before reuse. Forms shall be readily removable without hammering or prying against the concrete.

b. Form ties shall be of suitable design and adequate strength for the purpose. Wire ties will not be permitted where discoloration of the finished surface would be objectionable. Bolts and rods which are to be completely withdrawn shall be coated with grease.

c. Joints. Exterior corners of columns, girders and beams and other exposed joints in more than one plane, unless otherwise indicated on the drawings or directed, shall be beveled, rounded or chamfered by moldings placed in the forms.

d. Coating. Forms for exposed surfaces shall be coated with oil before reinforcement is placed. Surplus oil on form surfaces and any oil on reinforcing steel shall be removed. Forms for surfaces not exposed to view or normal weathering may be thoroughly wet with water in lieu of oiling immediately before placing of concrete, except that in cold weather with probable freezing temperatures, oiling shall be mandatory. Wood forms for concrete that is to be painted shall be coated with sealer instead of with oil or water. Sealer shall be a water-repellant wood preservative.

e. Removal. Forms shall be removed only with approval of the Contracting Officer and in a manner to insure complete safety of the structure. Where the structure as a whole is supported on shores, the beam and girder sides, columns and similar vertical forms may be removed after 24 hours, provided concrete is sufficiently hard not to be injured thereby. In no case shall supporting forms or shoring be removed until members have the strength specified in subdivision (1) below. Care shall be taken to avoid spalling the concrete surface. Wood forms shall be removed completely from under steps and similar dead spaces, through temporary openings if necessary.

(1) Control tests. Results of suitable control tests will be used as evidence that concrete has attained sufficient strength to permit removal of supporting forms. Cylinders required for control tests shall be provided in addition to those otherwise required by this specification. Test specimens shall be removed from molds at the end of 24 hours and stored in the structure as near points of sampling as possible, shall receive insofar as practicable the same protection from the elements during curing as is given those portions of the structure which they represent, and shall not be removed from the structure for transmittal to the laboratory prior to expiration of three-fourths of the proposed period before removal of forms. In general, supporting forms or shoring shall not be removed until strength of control-test specimens has attained a value of at least 1,500 pounds for columns and 2,000 pounds for all other work. Care must be exercised to assure that the newly unsupported portions of the structure are not subjected to heavy construction or material loading.

(2) Clamps. Tie-rod clamps to be removed entirely from the wall shall be loosened 24 hours after concrete is placed, and form ties, except for a sufficient number to hold forms in place, may be removed at that time. Ties wholly withdrawn from walls shall be pulled toward inside faces.

(3) Filling tie-rod or bolt holes. Holes left by bolts or tie rods shall be filled solid with cement mortar. Holes passing entirely through walls shall be filled from inside faces with a device that will force the mortar through the outside faces, using a stop held at the outside wall surface to insure complete filling. Holes which do not pass entirely through walls shall be packed full. Excess mortar at faces of filled holes shall be struck off flush.

3-08. REINFORCING STEEL:

a. General. The contractor shall furnish and place all reinforcing bars, stirrups, hanger bars, wire fabric and other reinforcing materials as indicated on the project drawings, together with all necessary wire ties, chairs, spacers, supports, and other devices necessary to install and secure the reinforcing properly. Shop drawings showing bar lists and bending details shall be furnished, if required.

b. Forming and placing. Reinforcing bars shall be formed to the dimensions indicated on the project drawings. They shall be fabricated correctly at normal temperature. Bars of more than 1/2" diameter shall be bent to 180° angles, the radius to be not less than six times the diameter of the bar. Extended length of bend shall be not less than four times the diameter of the bar. Bars of less than 1/2" diameter shall be bent to a 90° angle with a radius not less than six times the diameter of the bar. Extended length of bend shall be not less than six times the diameter of the bar.

c. Splicing. Splices shall be made at points of least strain, and shall be staggered. Length of splices shall be greater than 40 times the bar diameter in main bars, and 25 times the rod diameter in distributing bars. Ties shall be made with 20 gage annealed steel wire.

e. Spacing and cover. Distance between bars shall be such that the introduction of coarse aggregate will not be retarded or impeded. Cover shall be as follows:

Slabs, walls	more than 3/4 inch
Beams	more than 1-1/2 inch
Foundations	more than 2-1/2 inches

3-09. CLASSES OF CONCRETE AND USAGE:

a. Strength requirements. Concrete of the various classes required shall be proportioned and mixed for the following strengths:

Class of Concrete	Minimum allowable compressive strength at 28 days
A - - - - -	3,000 psi
B - - - - -	2,500 "
C - - - - -	2,000 "

b. Usage. Concrete of the various classes shall be used as follows:

(1) Class A concrete. For all reinforced work as noted on the drawings or specified.

(2) Class B concrete. For all reinforced work not otherwise shown on the drawings or specified.

(3) Class C concrete. For all concrete not reinforced except as otherwise shown on the drawings or specified.

3-10. PROPORTIONING OF CONCRETE MIXES: Concrete shall be proportioned by weight.

a. Measurements. One bag of cement containing 1.17 cu. ft. will be considered as 110 lbs., and one gallon of water as 8.33 lbs. If bag batching is used the quantities will be such that there will be no fractional bags.

b. Corrective additions to remedy deficiencies in aggregate gradations shall be used only with the written approval of the Contracting Officer. When such additions are permitted, the material shall be measured separately for each batch of concrete.

c. Control. In the field, consistency shall be determined in accordance with JIS A-1101. The slump shall fall within the following limits, provided the required strength is obtained: The slump shall be 2 inches minimum and 3 inches maximum for vibrated concrete. When placing of concrete without vibration is approved, slump shall be from 3 to 6 inches.

3-11. JOB-MIXED CONCRETE - BATCHING AND MIXING: Concrete shall be mixed by a mechanical batch-type mixing plant provided with adequate facilities for accurate measurement and control of each material entering the mixer and for changing the proportions to conform to varying conditions of the work. The mixing-plant assembly shall permit ready inspection of operations at all times. The plant and its location shall be subject to approval.

a. Batching units shall be supplied with the following items:

(1) Weighing unit shall be provided for each type of material to indicate the scale load at convenient stages of the weighing operation. Weighing units shall be checked at times directed by and in the presence of the Contracting Officer, and required adjustments shall be made before further use.

(2) Water mechanism shall be tight, with the valves interlocked so that the discharge valves cannot be opened before the filling valve is fully closed, and shall be fitted with a graduated gage.

(3) Discharge gate shall control the mix to produce a ribboning and mixing of cement with aggregate. Delivery of materials from the batching equipment to the mixer shall be accurate within the following limits:

Material	Percentage by weight	Material	Percentage by weight
Cement	1/2	Fine aggregate	1* 1-1/4**
Water	1/2	Coarse aggregate	2 2-1/2

* Concrete w/reinforcement ** Plain concrete

b. Mixing units.

(1) Operation. Mixers shall not be charged in excess of rated capacity nor operated in excess of rated speed. Excessive mixing, requiring addition of water to preserve required consistency, will not be permitted. The entire batch shall be discharged before recharging.

(2) Mixing time shall be measured from the instant water is introduced into the drum containing all solids. All mixing water shall be introduced before one-fourth of the mixing time has elapsed. Mixing time for mixers of 1 cubic yard or less shall be 1-1/4 minutes; for mixers larger than 1 cubic yard, mixing time shall be increased 15 seconds for each additional half cubic yard or fraction thereof. If an air-entraining agent is used, additional mixing time shall be such as to provide the specified air content.

(3) Discharge lock. Unless waived by the Contracting Officer, a device to lock the discharge mechanism until the required mixing time has elapsed shall be provided on each mixer.

3-12. EXPANSION JOINTS shall be constructed as indicated on the drawings and as approved. In no case shall the reinforcement, corner protection angles or other fixed metal items embedded in or bonded into concrete be run continuous through an expansion joint.

a. Joints between slabs on earth and vertical surfaces where indicated shall be premolded expansion-joint filler strips. Unless otherwise noted or specified, such joints shall be 1/2 inch thick and the full depth of slab.

b. Joints with compound. Where joints are indicated to receive joint compound, the premolded expansion-joint filler strips, or other approved premolded strip material, shall be installed at the

proper level below the finished floor with a slightly tapered, dressed-and-oiled, wood strip temporarily secured to the top thereof. The wood strip shall be of sufficient depth to form a groove not less than 1 inch deep. After the concrete has set, the wood strip shall be removed and the groove shall be filled with a light-colored calking compound or with compound for poured application. Joint grooves shall be filled approximately flush, so as to be slightly concave after drying.

c. Finish at joints. Edges of cement floors or concrete slabs along expansion joints shall be neatly finished with a slightly rounded edging tool.

3-13. CONSTRUCTION JOINTS: The unit of operation shall not exceed 80 feet in any horizontal direction, unless otherwise required by the drawings. Concrete shall be placed continuously so that the unit will be monolithic in construction. At least 48 hours shall elapse between the casting of adjoining units, unless this requirement is waived by the Contracting Officer. Construction joints, if required, shall be located near the midpoint of spans for slabs, beams or girders, unless a beam intersects a girder at the center, in which case the joints in the girder shall be offset a distance equal to twice the width of the beam and provision for shear shall be made by use of inclined reinforcement. Joints in columns or piers shall be made at the underside if the deepest beam or girder framed thereto. Columns, piers or walls of ordinary height shall be poured at least 2 hours before any overhead work is placed thereon. Joints not shown or specified shall be so located as to least impair strength and appearance of work. Vertical joints in wall footings shall be reduced to a minimum. Except where indicated on the drawings, no jointing shall be made in footings or foundation work without written approval. Placement of concrete shall be at such a rate that surfaces of concrete not carried to joint levels will not have attained initial set before additional concrete is placed thereon. Girders, beams and slabs shall be placed in one operation. In walls of buildings having door and window openings, lifts of individual pours shall terminate at top and bottom of openings. Other lifts shall terminate at such levels as are indicated on the drawings, or as conform to structural requirements or architectural details, or both, as directed. Special provision shall be made for jointing successive pours as detailed on the drawings or required. To insure a level, straight joint in exposed vertical surfaces, a strip of dressed lumber shall be tacked to the inside of the forms at the construction joint. The concrete shall be poured to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, any irregularities in the joint line leveled off with a wood float, and all laitance removed.

3-14. INSTALLATION OF ANCHORAGE ITEMS: Anchors shall be secured in position, inspected and approved before placing concrete.

3-15. PREPARATION FOR PLACING: Water shall be removed from excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed without washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surfaces of mixing and conveying equipment. Reinforcement shall be secured in position, inspected and approved before pouring of concrete. Runways shall be provided for wheeled concrete-handling equipment; such equipment shall not be wheeled over reinforcement nor shall runways be supported on reinforcement. The subgrade shall be finished to the exact section of the bottom of the floor slab and shall be maintained in a smooth, compacted condition, in conformity with the required section and grade until the concrete is in place. The subgrade shall be thoroughly moistened, but not muddy, at the time the concrete is deposited.

3-16. PLACING CONCRETE: No concrete shall be placed in final position except in the presence of a Government inspector. The use of belt conveyors, chutes or similar equipment will not be permitted without written approval. Concrete shall be handled from mixer or transport vehicle to place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients until the approved unit of operation is completed. Concrete that has attained its initial set or has contained its mixing water for more than 45 minutes shall not be placed in the work. Placing will not be permitted when, in the opinion of the Contracting Officer, the sun, heat, wind or limitations of facilities furnished by the contractor prevent proper finishing and curing of the concrete. Forms or reinforcement shall not be splashed with concrete in advance of pouring. Concrete shall be placed in the forms as nearly as practicable in final position. Immediately after placing, concrete shall be compacted by thoroughly agitating in an of deposit as practicable. When pouring in intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run. Waste material and flushing water shall be discharged outside the forms.

3-17. COMPACTION: Concrete shall be placed in layers not over 12 inches deep. Each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand-spading, rodding and tamping as directed. Vibrators shall in no case be used to transport concrete inside forms. Use of form vibrators will not be permitted. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete. At least one spare vibrator or sufficient parts for repairing vibrators shall be maintained at the site at all times. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing objectionable segregation and shall be at least 20 seconds per square foot of exposed surface. The vibrator shall not be inserted into lower courses that have begun to set. Where absorptive form lining is used, the vibrator shall not be placed between the forms and the outer row of reinforcement, and in no case shall the vibrator be allowed to touch the absorptive form lining. Vibrators shall be applied at uniformly spaced points not farther apart than the visible effectiveness of the machine.

3-18. BONDING AND GROUTING: Before depositing new concrete on or against concrete that has set, existing surfaces shall be thoroughly roughened and cleaned of laitance, foreign matter and loose particles. Forms shall be retightened and existing surfaces slushed with a grout coat of neat cement. New concrete shall be placed before the grout has attained initial set. Horizontal construction joints shall be given a brush coat of grout consisting of cement and fine aggregate in the same proportion as concrete to be placed, followed by approximately 3 inches of concrete of regular mix except that the proportion of coarse aggregate shall be reduced 50 percent. Grout for setting column bases, wall plates and other metal items shall be composed of equal parts of sand and portland cement, with water sufficient to produce required consistency.

3-19. SLABS ON GRADE: The installation of underground and embedded items shall be approved before slabs are placed. Any fill indicated or required to raise the subgrade shall be installed as specified in the section on EXCAVATION, FILLING, AND BACKFILLING. Gravel or sand drainage fill, 6 inches thick, shall be installed under interior floor slabs, shall be leveled to a reasonably true and even surface, and shall be covered with kraft paper of the kind used for curing, or with 30 pound asphalt-saturated felt, lapped at least 4 inches at edges and ends. The concrete shall have a slump of no more than 2 inches unless specifically authorized. Concrete shall be compacted, screeded to grade, and prepared for the specified finish. Contraction joints shall be provided in large slabs by pouring the slab in alternate checkerboard sections approximately 800 square feet in area or, at the option of the contractor, the slab may be poured continuous, as limited by expansion and construction joints, and contraction joints may be cut with an approved concrete-sawing machine or may be formed by the insertion of fiberboard strips in the wet concrete. Sawed joints shall be cut at a time to be determined by the Contracting Officer and shall be 1/8 inch in width and approximately 1/4 of the slab thickness in depth, unless otherwise shown on the drawings or directed, sludge and cutting debris shall be removed from cut joints. Fiberboard joints shall be made with a strip of 1/8-inch-thick hard-pressed fiberboard approximately 1/4 of the slab thickness in width and in as long lengths as practicable. After the first floating, the concrete shall be grooved with a tool, to a depth approximately equal to the width of the strip, at the desired joint locations. The strip shall be inserted in the groove until the top edge is flush with the surface of slab, using a U-shaped device of sheet metal fitted over the top edge of the strip to maintain alignment. When the concrete has set sufficiently to retain the strip, the sheet metal device shall be withdrawn. The slab shall be floated and finished as specified, using an edging tool on each side of the inserted joint.

3-20. FINISHES OF CONCRETE OTHER THAN FLOORS AND SLABS: Slight honeycomb and minor defects shall be patched with cement mortar of 1 part cement to 2 parts fine aggregate. Exposed surfaces shall be given one of the following finishes, as indicated on the drawings or specified:

a. Rough finish. Concrete for which no other finish is indicated or specified shall have fins and rough edges removed.

b. Smooth finish. Unless otherwise shown on the drawings, smooth finish shall be given to all exposed exterior and interior concrete surfaces which are not to be covered by other construction and shall be obtained by use of hardboard or plywood forms, form linings, or forms specially designed for reuse. Forms and form linings shall be used in as large sheets as practicable, with smooth even edges, and forms and form linings shall be installed with close joints. Joint marks shall be smoothed off and blemishes removed, leaving finished surfaces smooth and unmarred, subject to approval, except that joint marks resulting from the use of forms specially designed for reuse which produce a pattern regular and pleasing in appearance and which do not impair the integrity of the surface need not be removed.

3-21. CONCRETE FLOOR FINISHES: Concrete slabs shall be finished as hereinafter described. The dusting of wearing surfaces with dry materials will not be permitted. In preparation for finishing, floor slabs shall be struck off true to the required level, at or below the elevation or grade of the finished floors as shown on the drawings. Floors shall be level with a tolerance of 1/8 inch in 10 feet except where drains occur, in which case the floors shall be pitched to the drains as indicated on the drawings or as directed.

a. Monolithic finish. Floors where no floor covering is specified shall be finished by tamping the concrete with special tools to force the coarse aggregate away from the surface, then screeding and floating with straightedges to bring the surface to the required finish level shown on the drawings. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood-floated to a true even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. The concrete shall then be hand-troweled to produce a smooth impervious surface free from trowel marks. Additional troweling shall be given the surface for the purpose of burnishing. The final troweling shall produce a ringing sound from the trowel.

b. Wood-float finish shall be given to tops of walls and similar exposed surfaces and shall be obtained by tamping with special tools to force aggregate away from the surface, then screeding with straightedges to bring surface to required line as shown on the drawings. While the concrete is still green but hardened sufficiently to bear the cement finisher's weight, the surface shall be wood-floated to a true and uniform plane with no coarse aggregate visible.

c. Hardener application. Hardener shall be applied to concrete floors where scheduled on the drawings. The floors shall be thoroughly cured, cleaned, and perfectly dry with all work above them completed.

Zinc and/or magnesium fluosilicate shall be applied evenly, using 3 coats, allowing 24 hours between coats; the first coat shall be 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength; each coat shall be applied so as to remain wet on the concrete surface for 15 minutes. Sodium silicate shall be applied evenly, using 3 coats, allowing 24 hours between coats; the material shall be applied full-strength at the rate of 1/3 gallon per square feet. Approved proprietary hardeners shall be applied on conformance with the manufacturer's instructions. After the final coat is completed and dry, surplus hardener shall be removed from the surface by scrubbing and mopping with water.

22. CURING shall be accomplished by preventing loss of moisture, rapid temperature change and mechanical injury or injury from rain or flowing water for a period of 7 days when normal portland cement has been used, or 3 days when high-early-strength portland cement has been used. Curing shall be started as soon after placing and finishing as free water has disappeared from the surface of the concrete. Curing may be accomplished by any of the following methods or combination thereof, as approved.

a. Moist curing. Unformed surfaces shall be covered with burlap, cotton or other approved fabric mats, or with sand, and shall be kept continually wet. Forms shall be kept continually wet and if removed before the end of the curing period, curing shall be continued as on unformed surfaces, using suitable materials. Burlap shall be used only on surfaces which will be unexposed in the finished work and shall be in two layers.

b. Waterproof-paper curing. Surfaces shall be covered with waterproof paper lapped 4 inches at edges and ends and sealed. Paper shall be weighted to prevent displacement, and tears or holes appearing during the curing period shall be repaired immediately by patching.

c. Membrane curing compound shall be applied by power spraying equipment using a spray nozzle equipped with a wind guard. The compound shall be applied in a two-coat, continuous operations at a coverage of not more than 200 square feet per gallon for both coats. When application is made by hand sprayers, the second coat shall be applied in a direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, adherent film that shall not check, crack or peel, and shall be free from pinholes or other imperfections. Surfaces subjected to heavy rainfall within 3 hours after compound has been applied or surfaces damaged by subsequent construction operations within the curing period shall be resprayed at the rate specified above. Membrane curing compound shall not be used on surfaces which are to be treated with hardener. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic and other sources of abrasion during the curing period.

3-23. CONCRETE SLAB: Generator pad and transformer pad shall be concrete slab steel mesh reinforced. Foundation of room # 15 and roof slab of rooms # 33 and # 34 shall be reinforced concrete construction. Concrete deflector slab shall be provided facing runway.

SECTION 4. MASONRY; CONCRETE-MASONRY-UNIT

4-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of concrete-masonry-unit, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

4-02. APPLICABLE PUBLICATIONS:

a. Japanese Industrial Standards:

A-5406 Hollow Concrete Block

G-3101 Rolled Steel for General Use

4-03. MATERIALS:

a. Aggregate shall be as specified in Section 2, "Concrete" of these specifications.

b. Anchors, ties, and joint reinforcement shall be of approved design, and unless otherwise specified herein, shall be heavily galvanized metal of the following types and shall be furnished as specified herein-after:

(1) Wire-mesh ties shall be of steel wire not less than 0.0625 inch in nominal diameter (16 gage), 1/2-inch mesh, 3 inches wide.

(2) Wire ties shall be of steel wire not less than 0.1350 inch in nominal diameter (10 gage), looped at both ends.

(3) Corrugated or crimped metal ties shall be not less than 7/8 inch wide and of sheet steel not less than 0.0299 inch in nominal thickness (22 gage).

(4) Dovetail-type flat-bar or wire anchors for use with embedded slots or inserts shall be of sheet steel not less than 0.0598 inch (16 gage) by 1-inch-wide flat anchors for concrete masonry units and structural clay tile and of steel wire not less than 0.1483 inch (9 gage) for brick facing.

(5) Rigid steel anchors for anchorage of interior walls where bonding is impracticable shall be 1-1/4 inches by 3/16 inch with ends turned up not less than 2 inches.

(6) Reinforcing steel bars and rods shall conform to Federal Specification QQ-B-71, type B, grade 2, 3, 4, or 5, except that bars less than 1/4 inch in diameter may be type B, grade 1. Deformation shall conform to ASTM Standard A 305.

(7) Joint reinforcement shall be flat strips of welded steel wire fabric. Longitudinal wires may be smooth or deformed and shall be not less than 0.1620 inch in nominal diameter (8 gage). Cross wires shall be not less than 0.1046 inch (12 gage), spaced not more than 6 inches center to center for smooth longitudinal wires, and not more than 16 inches center to center for deformed longitudinal wires. The spacing of the longitudinal wires shall be 2 inches less than the nominal width of the block. Cross wires may be placed between and in the same plane as deformed longitudinal wires, but shall intersect above or below plain longitudinal wires with ends of cross wires not extending beyond the outer sides of the longitudinal wires. Joint reinforcement shall be furnished in flat sections ranging from 10 to 20 or more feet in length. Reinforcement furnished in rolls will not be permitted. Special shapes shall be provided for corners and wall intersections.

c. Cement used in the manufacture of concrete masonry units shall conform to JIS R-5210.

d. Concrete masonry units shall be of modular dimensions where available, and shall be made from portland cement and aggregate with or without the addition of other suitable materials, shall include all closer and jamb units, and shall be of the sized and special shapes required to complete the work as shown. Units shall be of the same manufacture and composition for each building or group of buildings, unless otherwise approved. Where units of more than one manufacturer are approved for use in the same building or group of buildings, the units shall be of similar composition, size, and appearance, and shall be secured by the same process. Units shall be sound and free from cracks, chipped edges, or other defects that would interfere with their proper setting or impair the strength, appearance, or durability of the construction. Units shall conform to JIS A-5406, class C. heavy weight. Units shall be free from of any deleterious matter that will stain plaster or corrode metal. shall be adequately cured before shipment, and shall have a moisture content, at time of delivery to the building site, of not more than 10 percent of the maximum percentage of total absorption of the units when tested in accordance with test methods described in JIS A-5406.

e. Mortar and mortar materials. A batch-type mechanical mixer of a type approved by the Contracting Officer shall be used. Mixing time shall be not less than 5 minutes, not less than 2 minutes of which shall be for the mixing of dry materials. When approved by the Contracting Officer, mortar may be mixed by hand for not less than 20

minutes in a water-tight mortar box. All mortar shall be used within 90 minutes and any left for longer than this period shall be discarded as waste material. No remixing of mortar with additional water, cement or other materials will be permitted. Proportioning of mortar shall be as follows:

Cement	1 bag (110 pounds)
Lime Putty	1 1/2 cu. ft.
Sand (dry)	7 cu. ft.

4-04. HANDLING AND STORAGE: Masonry units shall be stored in an approved manner that will protect them from contact with soil and exposure to weather. Representative samples shall be taken from on-the-site stock-piles periodically for testing the moisture content. Units that fail to meet the moisture-content limitation at any time during storage on the job shall not be used until dried and proved to be satisfactory by test. Care shall be taken in handling masonry units to avoid chipping and breakage. Storage piles, stacks, or bins shall be so located as to avoid being disturbed or shall be barricaded to protect these materials from damage by construction activities.

4-05. ERECTION:

a. General: Masonry shall not be erected when the ambient temperature is below 35°F. on a falling temperature except by written permission of the Contracting Officer. Masonry shall not be erected when, in the opinion of the Contracting Officer, the sun, heat, wind, or limitations of facilities furnished by the contractor prevent proper setting and curing of mortar joints or obtaining proper bond in the mortar. No frozen work shall be built upon. No units having a film or water or frost on their surface shall be laid in the walls. Concrete masonry units shall not be wetted before laying. Masonry shall be laid plumb, true to line, with level and accurately spaced courses and with each course breasting joints with the course next below. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Structural bond shall extend not less than 4 inches into the backup unit masonry. Courses shall be so spaced that backing masonry will level off flush with the face work at all bonding courses and at joints where metal ties are used in lieu of masonry bond. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other build-in items shall be solidly filled with mortar. Anchors, wall plugs, accessories, and other items required to be built in with masonry shall be built in as the masonry work progresses.

b. Masonry-unit walls: Each course shall be solidly bedded in mortar, unless otherwise shown on the drawings or specified, with vertical joints slushed full with mortar and breaking halfway over units in the

course next below. Mortar joints shall be approximately $3/8$ inch wide. Mortar joints in piers, columns, and pilasters, and starting courses on footings or solid foundation walls, except the first course in panels of cavity walls containing weep holes, shall be full-bedded under both face shells and webs. Other joints in exterior walls, including starter joints containing weep holes, shall have full mortar coverage on horizontal and vertical face shells, but mortar shall not extend through the unit on the web edges. Mortar joints on the weather side of exterior walls, other than walls to be stuccoed, shall be finished flush; however, the mortar shall be thoroughly compacted and pressed tight against the edges of the units with a proper tool. Units terminating against soffits of beams or slab construction shall be wedged tight with slate wedges, and the joint slushed solid with mortar. Each course shall be bonded at corners and intersections and shall be either bonded into the adjacent construction or anchored thereto with metal anchors spaced not over 2 feet on centers in each direction. Jamb units shall be of shapes and sizes required to bond with wall units and shall be built in where shown or required. No cells shall be left open in face surfaces. Sections of brickwork shall be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as required. Masonry-unit walls or partitions supporting plumbing or heating fixtures or other items, voids at door and window jambs, and other spaces requiring grout fill shall be filled solid with mortar mixed to pouring consistency. Cells of hollow masonry units shall be filled completely with mortar, maintaining all reinforcements carefully in place.

c. Lintels. Lintels in masonry-unit partitions and furring, unless otherwise shown on the drawings, shall be constructed of specially formed lintel blocks filled with class B concrete as specified under CONCRETE using coarse aggregate of $1/2$ -inch maximum size and shall be reinforced with not less than two $1/2$ -inch rods the full length of the lintel. Lintels shall extend at least 8 inches on each side of the opening.

4-06. SHRINKAGE-CRACKING CONTROL: Shrinkage cracking in concrete-masonry-unit construction shall be controlled by the following joint reinforcing. This control may consist of control joints spaced approximately 12 feet apart in walls with joint reinforcing above and below openings as specified hereinafter.

a. Joint reinforcement with control joints approximately 12 feet on centers, shall be placed in the first two bed joints under window sills, except where control joints are located at both ends of the sill, and reinforcement shall be placed in the first joint above a lintel, except where control joints are located at both ends of the lintel or where a bond beam is located not more than 16 inches above the lintel. Reinforcement shall extend not less than 20 inches beyond

the end of sills and lintels or to be end of the panel if less than 20 inches. Reinforcement shall be lapped not less than 6 inches, and the lap shall contain one cross wire of each piece of reinforcement.

4-07. BOND BEAMS: Bond beams shall consist of special bond-beam units filled with concrete and reinforced as indicated on drawings. Concrete shall be class B as specified under CONCRETE. Bond beams shall be broken at expansion joints and shall be broken at control joints where indicated on the drawings. Where control joints do not cross bond beams, dummy control joints shall be formed in the bond beam.

4-08. EXPANSION JOINTS:

a. Location: Expansion joints shall be located where shown on the drawings.

b. Size: Joints shall be not less than 1-1/2 inches nor more than 2 inches in width.

c. Method of installation shall be as follows unless otherwise detailed on the drawings. Blocks on each side of joint shall be metal-window jamb blocks having a 3/4- by 3/4-inch groove near center of the block. A weather seal consisting of a flexible joint-filler strip 1/2 inch thick and of sufficient length to reach continuously the entire story height shall be set into the grooves of the blocks and calked with plastic calking compound. The weather side of the joint shall be covered with an 8-inch-wide bellows strip of 0.044-inch-thick hard copper suitably secured to the block wall with corrosion-resistant fasteners. The interior side of the joint shall be covered with a sliding steel plate of 14-gage metal prime-coated for painting, secured with suitable fasteners to one side only of the block wall.

4-09. PRECAST TRIM: Precast trim shall be set with faces plumb and true, in a full bed of mortar, except that sills with lugs shall have mortar beds under the ends of the sill only. Sills shall be leveled and tapped in place on these beds. Upon completion of the walls the remainder of the bed joint shall be filled solid with mortar from front and back, and the exterior face of the mortar tooled smooth.

4-10. CUTTING AND PATCHING: Cutting and patching of masonry required to accommodate the work of others shall be performed by masonry mechanics.

4-11. UNFINISHED WORK: Unfinished work shall be stepped back for joining with new work; toothing may be resorted to only when specifically approved by the Contracting Officer. Before new work is started, loose mortar shall be removed and the exposed joint thoroughly wetted before laying new work.

4-12. PROTECTION OF MASONRY WALLS DURING ERECTION: Surfaces of masonry not being worked on shall be properly protected at all times during construction operations. At such time as rain or snow is imminent and the work is discontinued, the tops of exposed masonry walls shall be covered with a strong waterproof membrane, well secured in place. Adequate protection against damage to masonry walls resulting from wind action of backfilling operations during erection, shall be the responsibility of the Contractor, and any walls damaged by such causes shall be replaced at no cost to the Government.

4-13. CALKING: Calking compound shall conform to Federal Specification TT-C-598 for gun application. Calking shall be applied as specified under CALKING. Calking shall be installed at the following locations: exterior face of control joints, wall and column intersections, interior face of wall at junction with floor, and as required around door, window, and other openings in walls. In addition to applying sealer to the joint groove prior to application of the compound, as specified under CALKING, a coating of the sealer shall be applied to the surface of the calking compound prior to finish painting.

4-14. POINTING AND CLEANING: At completion of the work, holes in joints of exposed exterior masonry surfaces shall be filled with mortar and suitably tooled. After pointing has set and hardened, exposed masonry surfaces shall be cleaned with stiff fiber brushes, leaving the masonry clean, free of mortar daubs, and with tight mortar joints throughout. Immediately after cleaning, the masonry surfaces shall be thoroughly rinsed down with clean water.

SECTION 5. SHEET METAL WORK, BATTENED ROOF, AND MISCELLANEOUS METAL

5-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of sheet metal work, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

5-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this section of the specifications shall meet the requirements of Japanese Industrial Standards..

JIS	G-3302	Iron and Steel, Sheet Galvanized
JIS	A-6001	Paper, Waterproof
JIS	B-1151	Screws and Nuts
JIS	A-5508	Nails

5-03. GENERAL: Surfaces to which sheet metal is to be applied shall be even, smooth, sound thoroughly clean and dry, and free from all defects that might affect the application. Materials furnished under this section which are to be built in by others shall be delivered to the site in time to avoid delays to construction progress. All cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed under this section. All accessories or other items essential to the completeness of the sheet metal installation, though not specifically shown or specified, also shall be provided under this section. All such items, shall be galvanized ferrous metal where employed with galvanized iron or steel. Nails, screws, and bolts shall be of the types best suited for the intended purpose, and shall be of a composition that will not support galvanic action in the installation. Where sheet metal executed in a satisfactory manner. Waterproofed paper, except as otherwise specified, shall be provided as an underlayment for all sheet-metal linings or coverings.

5-04. MATERIALS:

a. Galvanized steel sheet. Galvanized steel sheet will be hot dipped in zinc. The zinc coating shall be 0.8 oz. per square foot and shall be smooth and free from chips and cracks. The finished surface shall show no exposed surface of base metal. Sheets will withstand 90 degree bends around a 1/8 inch rod without damage to the coating. Sheets will conform to JIS C-3302 and shall be of gage indicated on the drawings. Sheet steel shall conform to the product manufactured by

Osaka Teppan Seizo K.K., Toho Tokyo K.K., Tokyo Aen Mekki K.K., or approved equal.

b. Solder. Solder for galvanized metal will be tin lead type, conforming to Federal Specification QQ-S-571.

c. Soldering flux. Soldering flux shall be resin, muriatic acid properly killed with zinc, or zinc chloride.

d. Nails and screws. Nails and screws will be hot-dipped galvanized or of non-ferrous material.

e. Calking compound. Calking compound will be a bituminous mastic type of a consistency which is specified on Section "Calking".

f. Other materials and equipment. Other materials and equipment will be of the types and characteristics as indicated on the drawings and specified hereinafter.

5-05. SHOP DRAWING: Prior to the initiation of any work, shop drawing shall be submitted to the Contracting Officer for approval. Shop drawings will be required at the discretion of the Contracting Officer for whatever shop-fabricated sheet-metal items he deems necessary.

5-06. NAILING:

a. Nailing. Except as otherwise specified or indicated on the drawings, nailing in general shall be confined to sheet metal having a width of less than 12 inches. Nailing of flashing shall be confined to one edge only. Nails shall be spaced evenly and approximately 4 inches apart.

5-07. SOLDERING AND SEAMING:

a. Soldering. All edges of uncoated sheet metal to be soldered shall be pretinned before soldering is begun. Soldering shall be done slowly with heated coppers so as to thoroughly heat the seam and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder. For all materials, soldering shall follow immediately after application of the flux. Upon completion of soldering, acid shall be neutralized and surfaces shall be thoroughly cleaned.

b. Seams shall conform to the following requirements:

- (1) Standing seams shall finish not less than one-inch high.
- (2) Flat lock seams shall finish not less than 3/4-inch wide.
- (3) Soldering lap seams shall finish not less than one-inch wide.
- (4) Unsoldered plain lap seams shall lap not less than 3 inches wide.
- (5) All seams shall be made in the direction of the flow.

5-08. FLASHINGS: Flashings shall be installed at all intersections of roofs with vertical surfaces, eave edges and at other places shown on the drawings or as otherwise required to provide weathertight protection. Exposed edges of all flashings shall be folded back 1/2-inch to provide stiffness. Except as otherwise specified hereinafter or indicated on the drawings, cap flashing shall be provided.

a. Drip flashing. Drip flashing over windows shall be 28 gage galvanized steel sheet and shall extend up not less than 4 inches between the exterior finish sheathing, also under window sill.

b. Cap flashing. Cap flashing shall turn down not less than 4 inches over base flashings. On wood construction, cap flashing shall extend up not less than 4 inches above the roof. The cap flashing shall be formed to provide spring action against the base flashing.

5-09. HANGING GUTTERS: Hanging gutters shall be constructed of 26 gage galvanized sheet metal as indicated on the drawings. Hanging gutters shall be provided in sections approximately 6 feet long, joined by one inch soldered laps in the direction of flow. Supports shall be galvanized iron gutter hangers and shall be secured at spacings not greater than 36 inches on centers. End pieces, caps, miters, and reinforcing members shall be provided where indicated or required. Slip joints, where required, shall have grooves filled with white-lead paste.

5-10. DOWNSPOUTS: Downspouts shall be galvanized iron not lighter than 26 gage and cast iron pipe for lower part of the design and sizes indicated on the drawings. Except as hereinafter specified, downspouts

shall be provided in sections approximately 6 feet long. They shall be joined by lapped and soldered joints, and shall have 1-1/2-inch wide slip joints for each approximate 20 feet of length. Downspouts shall be set plumb and clear of the wall by 1-inch-wide straps secured to the downspout and firmly secured to the supporting construction. Material for straps shall be as indicated on the drawings. Straps shall be placed at top and bottom of downspouts, at each floor level, and at intermediate points as indicated or required. Elbows, offsets, and shoes shall be provided as indicated on the drawings, and elsewhere as required. Basket strainers as shown in the drawings shall be set in loosely at gutter openings into downspouts or elbows. Concrete splash blocks shall be provided under downspouts.

5-11. BATTENED ROOFING:

a. Materials.

(1) Galvanized sheet metal. Galvanized iron sheet roofing shall be No. 28 gage, galvanized by hot dipping in zinc. The zinc coating shall be not less than 0.8 oz. per square foot, and smooth and free from chips and cracks. The galvanized surfaces shall show no exposed areas of base metal. Sheets shall conform to JIS G-3302.

(2) Cleats shall be of the type required to fasten the sheets to the wood battens and shall be used in sufficient quantity to withstand the designed load, 24 gage galvanized iron sheet.

(3) Nails shall be zinc coated and enough size to secure wood battens and metal sheet to sheathing.

(4) Calking compound shall be bituminous mastic type of a consistency that can be worked with a putty knife. Compound shall adhere to wood, masonry and metal, and shall not crack, or shrink more than 20 percent.

(5) Asphalt felt shall conform to the requirements of JIS A-6001, weighing 15 pounds per 100 square feet, rag type.

b. Application. One layer of felt shall be laid over the roof sheathing, with all ends and edges lapped 6 inches, secured with galvanized nails and washers. After that wood batten shall be placed in the direction of flow, and securely nailed to sheathing board. Sheet metal cleat 24 gage, 1-1/2 inch wide shall be nailed on top of batten 12 inches on centers staggered for both sides. Metal pans shall be formed out of 28 gage galvanized iron sheet, ends stand up on sides of battens and lock hooked with cleats. Lay top cover strip of 28 gage galvanized iron sheet, both ends lock seamed securely to ends of pans.

Flat lock seams shall be not less than 3/4 inch. Eave end of pans shall cover sheathing and securely nailed to soffit of sheathing ends folded 1 inch. Eave end of battens shall be covered with the same metal and soldered. Ridge battens shall be covered similar to roof battens. Intersection of roof battens and ridge battens shall be locked and soldered.

"-12." MISCELLANEOUS SHEET METAL WORK:

a. Metal door.

(1) Flush hollow metal door shall be of the thickness indicated on the drawing, and shall be constructed of two sheets of finest grade 16 gage cold rolled stretcher leveled steel. Vertical reinforcements shall be lock-clipped and welded, and shall run the full length of the door 5 inches on center. Stiffeners shall be 2-1/2-inch wide channels formed into male and female interlocking members and spot welded to each inside face of the door. Top and bottom of door shall be reinforced by a 14-gage channel, full-width, spot welded every 4 inches on both sides. Each edge of door shall be reinforced by 16 gage channel to run full height. Joints on the edge of door shall be arc welded 3 inches on center, ground smooth and filled with metallic filler. Door shall be accurately mortised for locks and hinges. Adequate reinforcement shall be provided with steel plates welded to the interior reinforcing channels, and drilled and tapped. Reinforcement shall also be provided for door check and other surface applied hardware, if any, for which drilling and tapping is to be done in the field.

(2) Door frame, shall be of sizes and design shown and shall be fabricated of sheet metal, patent leveled, full pickled and free from blisters, pits; burns and other defects. Frame shall be of 12-gage material. Where plaster occurs, the edge of the frame shall be flanged to form a plaster ground, unless indicated otherwise on the drawings. Corners shall be reinforced and shall be mitered and welded their full length, and dressed flush on the exposed surface. Miters shall be well formed and in true alignment. The finished work shall be strong and rigid, neat in appearance, and free from all defects. Frame shall have steel adjustable anchors for each jamb, spaced approximately 2'-0" on centers, or be provided with other means of securing to structure as approved by the Contracting Officer. Anchors shall be set prior to placing of concrete and during erection of metal lath partitions. Where possible, steel spreaders shall be provided at the bottom between jamb members, so formed and secured that they may remain in place and be concealed in the finished work. Frame in masonry construction shall be filled solidly with mortar. Suitable means for anchorage of frames to floor shall be provided, so arranged that vertical adjustment of frames may be obtained.

b. Cyclone mesh guard. Cyclone mesh shall conform to requirements of Federal Specification RR-F-191, 9 gage zinc coated steel wire, 2 inch mesh. Ends of woven mesh shall be securely riveted to angle framing with flat bars. Angle framing shall be screw fastened to window frames.

5-13. CHAIN HOIST RAILS: Rails of the size and weight indicated shall be provided where shown on the drawings as required for the chain hoist. Rails shall be installed in accordance with the details shown on the drawings and shall be adequately secured for a maximum dead load plus 150 per cent of specified net capacity or weight. Rails shall conform to ASTM Designation A2-49T, "Specification for Rails, Open-Hearth, Steel Girders, of Plain Grooved, and Guard Types."

SECTION 6. CARPENTRY AND JOINERY

6-01. SCOPE: The work covered by this part of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the installation of carpentry and joinery, complet, in strict accordance with this part of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

6-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U.S. Federal Specifications and equivalent Japanese Industrial Standards and in each case that specification requiring the higher standard of appearance, quality and performance shall govern.

- a. U.S. Federal Specifications.
- b. Japanese Industrial Standards.

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
FF-H-191	A-6001	Building Paper
FF-S-111	B-1151-52-53-54	Screw and Nuts
FF-B-571	G-3121	Bolts and Nuts
FF-B-561	B-1131-32-34	Bolts, Lag
FF-N-101	A-5508	Nails
CS-45-48		Plywood
CG-451	K-6803	Glue, Animal, (non-waterproof)
CG-456		Glue, Casein Type (water-resistant)
MM-I-736	-----	Lumber and Timber, Hardwood
MM-I-751	-----	Lumber and Timber, Softwood
Appendices		
IC, ID		
TT-V-121	K-5444	Varnish, Spar, Water Resisting
TT-W-251	K-5103	White Lead, Past-in-Oil

6-03. LUMBER USAGES, GRADES AND SPECIES OF WOOD:

a. All structural timbers and lumber, insofar as they meet the foregoing specifications and the requirements of the drawings, shall be Japanese products and species. Where lengths or sizes exceed Japanese market sizes least cost will govern the choice of Japanese special-run or imported timbers.

b. It shall be the contractor's option to make substitutions of species within usage classification provided the characteristics required by such usages are fully met or exceeded by the species so substituted.

c. Framing and Structural Lumber.

<u>Use</u>	<u>Grade</u>	<u>Species</u>
(1) Stress-Grade Lumber, Allowable Stresses, 1125 - p.s.i. in Extreme Fiber in Bending	App. IC	Matsu (Pine) Structural Quality
(2) Stress-Grade Lumber, 1125 p.s.i., Imported	App. IC	Pine or Douglas Fir
(3) Joists, Headers, Sleepers	App. ID	Sugi (Red Cedar)
(4) Studs, Girts, Plates, Caps, Bucks	App. ID	Sugi (Red Cedar)
(5) Bracing, Furring, Grounds	App. ID	Sugi (Red Cedar)
(6) Wall Sheathing, Roof Sheathing, Subflooring	App. ID	Sugi (Red Cedar)

d. Exterior Woodwork.

(1) Facia, Trim	App. IC	Sugi (Red Cedar)
(2) Doors - Exterior	App. IC	Hinoki (Cypress)
(3) Door Frames - Exterior	App. IC	Sugi (Red Cedar)
(4) Sash	App. IC	Hinoki (Cypress)
(5) Window Frames Exposed Members not Otherwise Specified	App. IC	Sugi (Red Cedar)
(6) Sills	App. IC	Sugi (Red Cedar)

e. Interior Woodwork

(1) Interior Trim	App. IC	Sugi (Red Cedar)
(2) Threshold	App. IC	Nara (Oak)
(3) Interior Doors	App. IC	Hinoki (Cypress)

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|-----------------------------|---------|------------------|
| (4) Shelving and Closets | App. ID | Hinoki (Cypress) |
| (5) Counter Tops, Uncovered | App. IC | Nara (Oak) |

6-04. MOISTURE CONTENT: Unless otherwise specified, lumber shall be either air-dried or kiln-dried and the moisture content shall not exceed nineteen (19) percent. Exterior and interior finishing lumber shall be kiln-dried and at time of delivery to the building site the moisture content shall not exceed twelve (12) percent for material one inch or less in thickness, and shall not exceed fourteen (14) percent for material over one inch in thickness. Millwork, which is assembled or built up of more than one piece at the mill, except doors, shall not have a greater moisture content than twelve (12) percent.

6-05. STORAGE AND PROTECTION: Stack framing lumber and plywood to insure proper ventilation and drainage. Protect lumber and plywood from the elements. Protect millwork from dampness during and after delivery. Do not store or install any millwork in any part of building until concrete and plaster work are dry.

6-06. SIZES AND PATTERNS: Unless otherwise indicated sizes of wood members are nominal rough dimension sizes, milled as specified and/or as called for on the drawings except as may be marked net sizes. Unless otherwise indicated all lumber shall be surfaced 4 sides subject to the following option. All plates may be S1S2E. All studs and joists may be S2E. All sheathing may be S1S2E. Solid blocking may be S2E. Lumber shall be tongued-and-grooved, shiplapped, or worked to such patterns as are indicated on the drawings.

6-07. PLYWOOD: Plywood shall be of shina, nara or tamo for ordinary use, Type 2, and of sen for exterior use, Type 1. Plywood for doors shall be of nara, tamo or shina, Type 2. Finish surfaces shall be smooth, flat and free from cracks and splits. Individual plies shall show no separation. Plywood shall be one or two sides good as required. Plywood for door panels or flush door facings shall show no knots. Types are those approved by the Ministry of Agriculture and Forestry, in the publication, "Export Plywood and Veneer Chests (fabricated products) Standards". All plywood shall be bonded with phenol resin glue unless shown or specified otherwise. Items shall be equivalent to the best products of Tokyo Gohan, Akita Mokuzai or Mitsui Kokuzai Co., Ltd.

6-08. MATERIALS OTHER THAN LUMBER:

a. Glue. Glue for all exterior plywood and joinery shall be phenol-resin type, and for interior work animal type and shall conform to Japanese Industrial Standard K-6803 or Federal Specification CG-451.

b. Rough hardware shall be hot coal-tar treated, and shall conform to the following specification requirements:

Straps, Clamps, etc., of Steel..... JIS G-3101
Anchor Bolts, and Other Bolts, Steel... JES 100
Rough and Finish Nails..... JIS A-5508

c. Asbestos cement board shall be a composition of asbestos fiber and portland cement, containing not more than 1 percent organic fiber by weight. Unless otherwise indicated in the drawings asbestos cement board shall be supplied in 3/16 inch thickness, "flexible" type, having a maximum water absorption (24 hours) of 22 percent by weight.

d. Celotex shall be 1/2 inch thick semi-hardtex and best quality of Asano Bussan K.K. or equal.

e. Waterproof sheathing paper and felt. Sheathing paper shall be waterproofed with asphalt, but shall not stick when rolled and shall not crack when bent. Paper shall not break under 20 pounds per inch width, and shall resist water for 24 hours and shall be a product of the Daiken Kogyo Co., Osaka, Japan, or equal, and shall weigh not less than 8 pounds per 100 square feet.

f. Coal-tar creosote. Coal-tar creosote shall be a distillate of coal-gas tar or coke-oven tar. It shall have no more than 3 percent water by volume, be no more than 0.5 percent insoluble in benzol by weight, and shall have specific gravity of not less than 1.03 at 15.5°C.

6-9. TREATED LUMBER: All lumber coming directly in contact with concrete floors or foundation walls shall be given a treatment of pentachlorophenol (5 percent solution) in petroleum, or approximately one pound of oil soluble pentachlorophenol in powder form in 3 gallons of petroleum, as manufactured by the Mitsui Chemical Co. or an approved equal, and conforming to the requirements of JIS K-1551 or shall be treated with coal-tar creosotes. Lumber shall contain creosotes in amount of 6 pounds per cubic feet.

6-10. FRAMING: Framing lumber and other rough work shall be properly framed, closely fitted, accurately set to required lines and levels, and rigidly secured in place. Where required, timber connectors and their installation shall conform to the best Japanese practice. Rafters and joists shall be set with crown edges up and bottom edges shall be free from pronounced defects. Studs and joists shall be sized to provide even surfaces for finish. Framing shall be done so as to avoid cutting structural members. Framing members shall be cut, notched, or bored only where necessary. Framing members weakened by cutting shall be reinforced as directed by the Contracting Officer.

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Special framing of construction, not explicitly shown or specified, shall be provided as required to complete the work in the best and most workmanlike manner. Nails and bolts shall be of the sizes and quantities shown on the drawings, or as appropriate for the various connections.

a. Partitions and walls. Partitions and walls shall be framed with 2 by 4 inch and 2 by 6 inch studs spaced 18 inches on centers, unless otherwise shown on the drawings. Plates of partitions and walls resting on concrete floors shall be anchored in place with 1/2 inch bolts spaced not more than 5 feet apart, unless otherwise shown. Studs and headers at openings, more than one foot from other parallel studs or belting, shall be doubled or shall be solid members of similar size. Corners shall be thoroughly spiked and made solid. Studs shall be framed as shown or required for proper installation of trim and other work.

6-11. SHEATHING: Roof and roof sheathing shall be 3/4 inch thick, unless otherwise shown and shall be even-width, dressed stock, matched, shiplapped, or square-edged, applied diagonally or horizontally as indicated on the drawings, and blind nailed to each bearing using two eightpenny nails for 8 inch boards and three nails for 10 inch boards. Courses shall be driven up tight and end joints closely fitted. With square and lumber, all joints shall be over supports and well distributed; with end-matched lumber, end joints may occur at random with at least two boards between rafters, and no piece having bearing on less than two supports.

6-12. SHEATHING PAPER: Sheathing paper shall be installed over all wood sheathing. Edges and ends of the material shall be lapped at least 6 inches. Paper shall be laid horizontally beginning at the bottom and shall extend back of window casings and other finish work.

6-13. EXTERIOR FINISH: Exterior finish shall be finished with stucco, wood sheathing and metal lathing is necessary. Door and window trims and sills shall be in single length and trims shall be rabbeted for stucco finish.

Have soffit board, 5/8 inch thick, shall be shiplapped and securely nailed to back furring providing metal screen vent.

6-14. EXTERIOR DOOR FRAMES: Exterior door frames, unless otherwise shown, shall be 1-3/4 inches thick and double-rabbeted from the solid for doors and screens of thicknesses specified. The frame shall be secured to studs and plates with double wedge block and fastened with nails at top, bottom, and intermediate points. Shop drawings shall be submitted.

6-15. WINDOW FRAMES AND SASHES: Window frames shall conform to the following requirements.

a. Sliding window frames shall be of the sizes and thickness indicated, head grooved for the sash, sill provided with brass track rails.

b. Sash. Sash shall be of size and design indicated. Windows shall be built in the shop and not site fabricated. The each shall be of mortised or mitered construction. Phenol resin glue shall be used to reinforce all joints. All sash shall be rabbeted for putty glazing on the outside.

6-16. INTERIOR DOOR FRAMES: Interior door frames shall be 1-3/8 inches thick, full width of finished wall or partition, double-rabbeted from the solid. Frames shall be set plumb and square, and secured with finishing nails. Double-wedge blocking shall be driven back of jambs at nailing points, also at back of butts and lock strikes.

6-17. DOORS: Door shall be of the sizes, thicknesses, and designs indicated on the drawings, shall be of the construction and species hereinafter specified, and shall be of the grade hereinafter specified for the finish indicated on the drawings or specified. Top and bottom edges of doors shall be given two coat of spar varnish at the factory before shipment. Exterior doors shall be fabricated with water-resistant adhesives.

a. Exterior panel doors. Panelled doors shall be of the sizes, thicknesses and designs indicated on the drawings, and shall be constructed of the species hereinbefore specified. Doors shall be the best products of the manufacturer and shall not be site fabricated. Doors shall be of mortise and tenon construction glued with phenol-resin glue. Rails and stiles shall be free from loose knots, warpage, cracks and other defects. Panels shall be of solid boards or of water-resistant plywood. Panels shall not be glued at the edges but shall be capable of self-adjustment within the stiles and rails to prevent splitting. Glass panels shall be provided as shown set with putty and glazing beads or moldings. Louvered doors shall have solid frame routed out to receive the louver slats. Doors shall have 1/16 inch clearance at the sides and top, and 3/16 inch clearance at the bottom. The top and bottom edges of doors shall be given two coats of spar varnish at the factory before shipment.

b. Flush doors. Doors shall be constructed of thoroughly seasoned uniform moisture content of not over 6%. Face veneers on all doors shall be of nara unless otherwise specified, and shall be No. 1 grade for natural finish, No. 2 grade for painting

and shall be machine sanded. Edge banding on sides of doors shall be a matching hardwood 3/4-inch thickness. Edge banding on top and bottom shall be any sound and compatible hardwood, not less than 1" thick. Cores shall be pine, or sugi, laid up in vertical block or stile and rail construction.

All glue used in fabricating doors shall be of the waterproof phenolic resin type.

Plywood for toilet partition doors shall be waterproofing quality. Doors to be painted shall be given a shop prime coat. Doors to have natural finish shall be factory sealed with a first class clear sealer or white shellac suitable for subsequent natural finish at job site.

Louver on flush door shall be the same wood as the face of door.

c. Dutch door shall be flush plywood door in two sections. Lower section shall be provided with 1 inch thick hardwood counter board at the top securely fastened to the door with steel angle brackets as shown. Upper section shall be ordinal flush door. Door sections shall be provided with barrel bolts to act the doors in one unit.

6-18. FITTING, HANGING AND TRIMMING: Windows and doors shall be fitted, hung, and trimmed as hereinafter specified and as indicated on the drawings. Doors shall have 1/16 inch clearance at sides and top, and 3/16 inch clearance over thresholds, unless otherwise directed by the Contracting Officer. Doors 1-3/4 inches or more in thickness shall have the lock or latch edge beveled at the rate of 1/8 inch in 2 inches. Doors shall be hung and trimmed with hardware as specified on Section FINISH HARDWARE. Locks with standardized cases shall all be installed at the same height. Knob locks and knob latches shall have the center of the knob 42 inches above the finished floor. Cylinder dead locks shall have the center of the cylinder at the same height as the center of the cylinder of the knob locks.

6-19. INTERIOR FINISH: Walls shall be finished with celotex board, asbestos cement board or plywood as shown on the drawings, nailed to studs and girts 9 inch on centers. Joint shall be V shape and tightly fitted. Ceiling stop mold of the same wood shall run at the top of wall. Ceiling shall be finished the same as wall and nailed to suspended furring as shown. Joints shall be equal to wall. Nail holes shall be predrilled for Asbestos cement boards, not less than 2 inches from the edges.

6-20. INSULATION; BLANKET TYPE shall be mineral wool and conform to JIS Z-9504.

a. Material. Wall insulation shall be class C mineral wool having one impermeable and one permeable membrane face. Ceiling insulation shall be either class C or class B mineral wool having an impermeable membrane on one face only. Mineral wool shall be rock wool or glass wool. Adhesives used to bond facings to insulating materials shall be insoluble in water.

b. Installation:

(1) Wall insulation shall be centered on stud space, providing equal air spaces on both sides.

(2) Ceiling insulation shall be installed tight against the upper surface of the ceiling material.

(3) Membrane tabs shall be securely stapled or nailed to inside faces of studs and upper edges of joists or shall have batten-strips nailed to sides of studs or joists in order to assure airseal.

6-21. SIDING: Asbestos cement flat sheet 1/4 inch thick shall be used for exterior siding, size as shown on the drawing, and the best products equal to the manufacture of Asano Slate Co., Ltd. The sheets shall butt the vertical joints and these joints shall be covered with waterproof metal flashings from the backside of the sheets. The horizontal joints of the sheets are made by having the upper sheet overlap the lower one a minimum of 5/8 inch. Fasteners shall not be placed through flashings. Spacing of studs and girts shall be 16 inch to 24 inch on centers. Fasteners shall be nails, screws or bolts. Holes shall be predrilled. Fasteners shall be placed not less than 1/2 inch from edges of the sheets. The sheet shall be durable, dense, light, and shall be handled with care against impact shocks and dropping. All sheets shall be piled on firm, level supports enough to support extending full width of the sheets.

6-22. WORKBENCH, COUNTER, RACK AND SHELVES shall be constructed as shown on the drawing. Rough framing shall be softwood and securely fastened to floor with angle clips. Finish framing shall be hardwood shiplap jointed. Plywood shelving and doors shall be provided with necessary hardware. Shelves for Racks shall be adjustable, using supports Type 1067 of Federal Specification FF-H-111a or equal.

SECTION 7. CALKING

7-01. SCOPE: Furnish all plant, labor, equipment and materials and perform all work in connection with calking, complete, in strict accordance with this section and the applicable drawings, subject to the terms and conditions of the contract.

7-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U. S. Federal Specifications and equivalent Japanese Industrial Standards and in each case that specification requiring the higher standard or quality, performance and safety shall apply.

a.	<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
	TT-C-598	-----	Compound, calking, plastic

7-03. SAMPLES: Before the work of application is started, samples of all materials proposed for use shall be submitted to the Contracting Officer for approval.

7-04. MATERIALS:

a. Calking compound shall be composed of pigments with or without fibers uniformly mixed in a liquid vehicle to a consistency suitable for calking joints in wood or masonry structures and at the periphery of wood or metal frames therein. The composition of the material is not further specified but is subject to the approval of the Contracting Officer. The standards of performance, quality and permanence shall be not lesser than the Standard Johns-Manville project for knife and gun calking of structures. The compound shall remain permanently slightly plastic and shall show an ultimate shrinkage of not more than 20 percent which adhere to concretes, wood or metal perfectly.

b. Sealer. Sealer for calking joint, when required, shall be a quick-drying liquid recommended by the manufacturer of the calking compound.

c. Rope yarn. Rope yarn shall be the ravelled strands of rope fiber free from oil or other staining element.

7-05. COLOR: Unless otherwise specified, color of calking compound shall match adjoining finish or as directed or approved by the Contracting Officer.

7-06. INSTALLATION:

a. Preparation. Except as otherwise indicated in the drawings, calking in joints shall be a minimum of 3/4 inch in depth and 1/4

inch in width. All particles of mortar, dust, and other foreign matter shall be brushed out and, just prior to calking, the joint grooves shall be coated with an application of sealer. Where a suitable mortar backstop has not been provided, the back of joint grooves shall be packed tightly with rope yarn.

b. Calking. The compound shall be driven into the joint groove with sufficient pressure to force out all air and to fill the joint grooves solidly calking, where exposed, shall be free of wrinkles, and shall be uniformly smooth. Calking around all openings in masonry shall include the entire perimeter of each opening. Upon completion of the calking, any calked joints not entirely filled shall be roughened and filled and the exposed surface tooled smooth.

c. Cleaning. The surfaces of all materials adjacent to the calked joints shall be cleaned of any smears of compound or other soiling due to the calking application.

SECTION 8. ACOUSTICAL TREATMENT

8-01. SCOPE: The work covered by this part of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the installation of acoustic tile, complete, in strict accordance with this part of the specifications and applicable drawings, and subject to the terms and conditions of the contract.

8-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U.S. Federal Specification and equivalent Japanese Industrial Standards are in each case that specification requiring the higher standard of quality, performance and safety shall apply.

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
SS-A-118b	A-5902	Tile, acoustic

8-03. MATERIALS:

a. Acoustic tiles shall be 12"x12"x1/2" thick all-mineral fiber butt edge units with 1/8" bevelled face edges. Tiles used shall have a noise reduction coefficient of not less than 0.72 based on the average of the sound absorption coefficients at 250, 500, 1000 and 2000 cycles. Acoustical units shall be of such a nature that 6 sprayed-on coats of resin-base emulsion paint will reduce the noise-reduction coefficient by no more than 0.05. Factory finish for tile units shall be a flame-proof paint containing an anti-fungus agent.

b. Adhesive shall be a natural resin base in petroleum naptha solvent adhesive similar in quality and performance to the product of the Minnesota Mining and Manufacturing Company's EC-461.

8-04. APPLICATION:

a. Surfaces to receive adhesive and tile shall be clean and dry.

b. Adhesive shall be applied in strict accordance with the manufacturer's recommendation for the weight of tile being used.

c. Tile shall be pre-primed and worked into place in the approved manner. All tile shall be bonded within 20 minutes after applying adhesive.

8-05. SAMPLES AND COLORS:

a. The following samples shall be submitted to the Contracting Officer for his approval prior to starting any acoustical tile work:

Four 12" x 12" acoustic tiles
One quart adhesive

b. Unless otherwise directed by the Contracting Officer, acoustic tiles shall be furnished with a factory pre-finish in "eggshell" white.

8-06. ACCEPTANCE AND REPAIRS: All acoustical tile work shall be accomplished to the satisfaction of the Contracting Officer. Any repair work resulting from inadequate workmanship or materials for a period of 12 months from date of acceptance shall be done by the contractor at his own expense.

SECTION 9. PLASTERING

9-01. SCOPE: The work covered by this part of the specifications consists in furnishing all labor, equipment and materials, except those furnished by the U. S. Government, and in performing all operations in connection with plastering in strict accordance with this part of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

9-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirement of Japanese Industrial Standards.

J.I.S.	G-3501	Wire, steel (carbon)
J.I.S.	A-5504	Metal lath
J.I.S.	R-5210	Cement, Portland
J.I.S.	A-6902	Lime, hydrated

9-03. GENERAL:

a. Plaster work shall be done only at temperatures of 40° F. or above, subject to the approval of the Contracting Officer.

b. Plaster work shall be 3 coat work not less than 3/4 inch thick unless otherwise indicated in the drawings.

9-04. MATERIALS:

a. Portland cement shall be a standard product of approved manufacture, free from contamination.

b. Lime shall be hydrated lime in which the total free (unhydrated) calcium oxide and magnesium oxide shall not exceed 8 percent by weight, ground so that 85% passes a No. 200 seive.

c. Lime putty shall be made from hydrated lime and water and shall be stored for 72 hours before use.

d. Sand shall be siliceous material, clean, hard, free from loadm, silt, or other impurities, and well-graded from fine to coarse with- in the following limitations:

<u>Sieve No.</u>	<u>Percentage Minimum</u>	<u>Retained Maximum</u>
8	-	10
30	15	80
50	70	95
100	95	-

and amounts of material finer than a No. 200 sieve shall not exceed 5 percent; and, in addition, all sand for finish coat work shall be white and shall pass a No. 12 sieve.

e. Acoustical plaster shall conform to the Federal Specification SS-A-111.

f. Water. Clean, fresh, and free from oils, acids, alkalies organic or other injurious matter.

g. Metal lath. Type F, type FR, or type F3/8R, expanded metal lath cut from copper bearing open hearth, re-annealed, hot-process galvanized sheets, weighing not less than 3.4 pounds per square yard.

h. Nails and staples. Specification No. FF-N-101, for attaching metal lath over sheathing shall be large-head galvanized nails with an approved furring device that will permit the formation of keys not less than 1/4 inch in thickness between the lath and the backing, and for attaching to horizontal wood supports shall be 1-1/2 inch, 11 gage, barbed roofing nails with 7/16 inch diameter heads, and to vertical wood supports with 4d common nails or 1 inch roofing nails with 7/16 inch diameter heads driven to a penetration of at least 3/4 inch or 1 inch, 14 gage, wire staples driven home. Nails or staples for attaching 3/8 inch rib lath to horizontal or vertical wood supports shall be 3/16 inch longer than those specified above, unless attachment is through rib in which case equivalent penetration into supports shall be provided. Common nails shall be bent over to engage at least 3 strands of flat lath or rib of 3/8 inch rib lath. Nails and staples used shall be galvanized.

i. Hair and fiber shall be clean and free of balls and knots, 1/2 to 2 inches long. Hair shall be from cattle or goats. Fiber shall be a vegetable products.

j. Water repellent shall be stearate or oleate of ammonium, sodium, or calcium in either powder, liquid, or paste; or a commercially manufactured product approved by the Contracting Officer who shall be furnished with the manufacturer's written statement indicating the fatty-acid content of the waterproofing compound submitted for approval.

9-05. SAMPLES AND COLORS:

a. Samples of the following materials shall be submitted for the Contracting Officer's approval before doing any Plaster Work.

(1) Two panels of the specified plasters about 12 inches square, showing color and texture.

(2) Ten pounds each of mill-mixed colored plasters.

(3) Two panels, 12"x24" cement plaster and acoustical plaster applied.

- (4) Two 12-inch squares of metal lath.
- (5) Five pounds of sand.
- (6) One-quarter pound of nails or staples.
- (7) Two pounds of water repellent.

b. Colors shall be as noted in the Finish Schedule in the drawings or be as directed by the Contracting Officer.

9-06. DELIVERY AND STORAGE OF MATERIALS: All manufactured materials shall be delivered in the original packages, containers, and bundles bearing the name of the manufacturer and brand. Plaster, cement, and lime shall be stored off the ground under water-tight cover, and away from sweating walls and other damp surfaces, until ready for use. Damaged or deteriorated materials shall be removed from the premises.

9-07. INSTALLATION OF METAL LATH: Metal lath shall be applied in such a manner to form true surfaces, without sags or buckles, and with long dimension of lath at right angles to supports. Metal lath shall be applied to ceiling and secured to supports not more than 6 inches on centers. Side laps on ceilings shall be tied not more than 6 inches on centers. Ribbed metal lath shall be fastened with staples over supports spaced not more than 21 inches on centers.

9-08. CEMENT PLASTER:

a. Mixing of plaster. Plaster shall be mixed in accordance with the printed instructions of the manufacturer. Copies, in duplicate, of the manufacturer's printed instructions shall be submitted to the Contracting Officer. Except when hand-mixing of small batches in specifically approved, mechanical mixers of an approved type shall be used for the mixing of plaster. Frozen, caked, or lumped materials shall not be used. Mechanical mixers, mixing boxes, and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water until uniform in color and consistency. Retempering will not be permitted, and all plaster which has begun to stiffen shall be discarded. Plaster for scratch coats shall be fibered, by the addition of one (1) pound of hair or fiber per bag of cement.

b. Cement plaster. Cement plaster shall be mixed in the following proportions by volume, for every coat.

One part cement,
2 parts sand,
 $\frac{1}{4}$ part lime putty.

If the sand is rather coarse or fine and/or too uniform in size of grains, the proportion of sand given above may be reduced to 2-3/4 parts in the

scratch coat. One lb. of hair shall be added to scratch coat only. The quantity of compound used shall provide 0.2 pounds of fatty acid for each 100 pounds of cement in the finish coat.

9-09. APPLICATION OF PLASTER: Temporary heat shall be provided during cold weather to protect the completed plaster work from damage. The use of salamanders will not be permitted. Surfaces that are to receive plaster shall be clean and free of defects. Where necessary to reduce suction, masonry surfaces shall be dampened evenly, but not soaked, with a fog spray. Regulated ventilation shall be provided. Plastering, except as otherwise indicated on the drawings or specified, shall be three (2) coat work with the scratch and brown coats. Ceilings shall be level and walls shall be straight and plumb. Corners and interior angles shall be square, with arrises slightly rounded. The thicknesses of interior plaster, from the face of plaster base to the finished plaster surfaces, shall be not less than $3/4$ inch. Special care shall be taken in mixing colored mortar to secure a uniform color throughout in the finished work. Mortar that has begun to set shall not be used. A water repellent shall be added to the finish coat. If in powder form, the water repellent shall be well mixed dry with the cementing materials. If in liquid or paste form, the repellent shall be added to, and mixed with the mixing water. If surfaces become dry in spots, the dry areas shall be dampened again to restore uniform suction. Plaster coats shall be applied continuously in one general direction, without allowing plaster to dry at edges. Where it is impossible to work the full dimension of a wall surface, jointing shall be made at a break, opening, or other natural division of the surface. Edges to be joined shall be dampened slightly to produce a smooth confluence.

9-10. WORKMANSHIP: All plane surfaces shall be level or plumb and shall contact a ten foot straightedge its entire length with not over $1/8$ inch variation either way. All corners and angles shall be true, plumb or level with arrises slightly rounded. Plaster shall be carried well up to grounds and frames. Surfaces shall be clean, free from cracks, blisters, pits, checks, crazing and discoloration. There shall be no visible junction marks where one day's work adjoins another.

a. Scratch coat. The scratch coat shall be approximately $3/8$ inch thick over the reinforcement and shall be applied under sufficient pressure to form good keys and to completely embed the reinforcement. Before the scratch coat has set, it shall be well cross-scratched to provide a strong bond. The scratch coat shall be dampcured 2 days before the brown coat is applied.

b. Brown coat. The brown coat shall be approximately $3/8$ inch thick. The scratch coat shall be dampened evenly with a fog spray to obtain uniform suction before the brown coat is applied. The brown coat shall be applied to the scratch coat with sufficient pressure to force the plaster into the scratches and shall be brought to a plumb, true, even surface, but left rough in texture. When set sufficiently, the brown coat shall be floated with a dry float and evenly cross-

scratched to form a bond for the finish coat. Rapid drying of the brown coat shall be prevented by spraying or by other method approved by the Contracting Officer. The interval between the application of the brown coat and of the finish coat shall be at least 7 days of dry weather.

c. Finish coats. Surfaces of the brown coat shall be dampened several hours before the finish coat is to be applied. Additional dampening at time of application shall be by fog-spraying. Dampening by brush will not be permitted. Trowel finish shall be applied over a base coat, which has set and is surface dry, shall be scratched in thoroughly, laid on well, doubled back, and filled out to a true, even surface. The thickness shall be 1/8 inch. The finish shall be allowed to draw a few minutes and then shall be well troweled with water to a smooth finish, free from blemishes. In the application of trowel finishes, the use of excessive water shall be avoided.

9-11. ACOUSTICAL PLASTER.

a. Materials.

(1) Acoustical plaster shall be composed of a cementitious material such as gypsum, portland cement, or lime, with or without a granular aggregate; with or without chemicals for producing gas when water is added.

(2) The material, when installed, shall be of such nature and thickness as to have a noise-reduction coefficient of not less than 0.65, based upon the average of the sound absorption coefficients at 256, 512, 1024 and 2048 cycles.

(3) All of the ingredients of the material used shall be incombustible.

(4) Acoustical plaster shall be of such a nature and thickness that 6 coats of resin-base-emulsion type paint, applied to the finish side, shall not reduce the noise-reduction coefficient by more than 0.05.

b. Application shall be in strict accordance with the manufacturer's recommendation. The plaster shall be supplied dry, with ingredients uniformly mixed, ready for use with the addition of water only. The material shall be applied with a plasterer's trowel to surfaces indicated in the drawings. Where plaster is applied directly to concrete, care shall be taken to assure that concrete surfaces are clean, free from oil, dust and loose particles of concrete. The plaster, upon drying, shall be reasonably hard and durable, of uniform thickness and finished with a cork float, steel trowel, roller or other means to a true surface. Workmanship shall be the same as described on para. 9-9, and 9-10.

9-12. SAMPLING OF PLASTER: Samples may be taken by the Contracting Officer at any time from plaster work in place. Areas represented by samples which show cover-sanding will be rejected.

9-13. ACCEPTANCE AND REPAIRING: Plaster with cracks, blisters, pits, checks, or discolorations will not be accepted. Plaster shall be clean and sound and in accordance with the requirements of these specifications. After all other related work has been completed, pointing around trim and set work and repairing of damaged portions shall be performed to the satisfaction of the Contracting Officer. Repairs shall match existing plaster in texture and color.

SECTION 10. FLOORING, ASPHALT TILE

10-01. SCOPE: The work covered by this part of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of flooring, asphalt tile, with rubber base, complete, in strict accordance with this part of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

10-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirement of the following U.S. Federal Specifications and equivalent Japanese Industrial Standards and in each case that specification requiring the higher standard of quality, performance and safety shall apply.

a.	<u>U.S.F.S.</u>	<u>J.I.S</u>	<u>Material</u>
	SS-T-306a		Asphalt Tile
	P-W-151a		Wax

10-03. MATERIALS:

a. Asphalt tile shall be 12 by 12 by 1/8 inch of one type and grade, color of asphalt tile shall be selected by the Contracting Officer, and best product of Tajima-Oyo-Kako Co., Fujimori Kogyo Co., or approved equal.

b. Primer for asphalt tile shall be cut-back-type. Out-back-type primer shall be a thin liquid composed of an asphaltic base and a suitable light volatile solvent, made specially for use with asphalt tile, and weighing approximately 10 pounds per gallon.

c. Adhesive. Cement for asphalt tile shall be the same quality as primer made specially for use as an adhesive for bedding and fastening asphalt tile to subfloors, and shall be of a heavy consistency that can be applied and effectively spread with a toothed trowel. Primer and adhesive shall be the best product of the manufacturers mentioned on Section 11-03a.

d. Wax, shall conform to Federal Specification P-W-151a, except non-slip type.

e. Metal edging strip. Extruded brass as detailed and fastened to slab with brass screws in lead or fiber plugs.

10-04. PREPARATION OF SUBFLOOR: Surfaces to receive asphalt tile shall be swept clean and shall be free from moisture, plant, oil and wax. Concrete floors shall have a smooth and even steel-troweled finish, and

shall have any cracks, rough areas or other surface defects filled with plastic material.

10-05. INSTALLATION:

a. Priming Coat. A coat of cjt-back-type primer shall be well worked into the surface of the concrete with stiff brushes or a straight-edged steel trowel using the minimum quantity that will assure covering the complete surface with a non-absorptive base. Primer shall be allowed to become thoroughly dry.

b. Adhesive. The cement shall be applied to the floor with a notched steel trowel and allowed to set up until the surface is tacky (30 minutes to 3 hours). The notches in the trowel shall be not over 1/16 inch deep and spaded 3/16 inch deep and spaced 3/16 inch on centers. The notches shall be maintained at the specified depth, and when reduced by wear, shall be removed with a fine V-shaped file.

c. Asphalt Tile. When the cement is sufficiently dry, the asphalt tile shall be installed in accordance with the design layout herein specified. Tile shall be laid in such a manner that the entire under surface will be securely bonded in place. Asphalt tile shall be laid out in a square pattern symmetrical about the center lines of each room, space or panel. Tile layout shall eliminate cut tile to the greatest extent possible. Cut-tile misfits shall be replaced with properly cut tile. Tile shall be tightly fitted so that each tile is in contact with the surrounding tiles and all joints are in proper alignment. The graining in alternate jaspers or marbolized tiles shall be reversed.

10-06. RUBBER BASE:

a. Rubber Base Tile shall conform to Federal Specification ZZ-T-301. The base shall be sufficiently flexible to allow for irregularities in walls and partitions. Special one-piece internal and external corner sections shall be provided for all right angle corners. Base shall be topset cove type, 3/16 inch thick by 6 inches high, unless otherwise indicated on the drawings. Color of base shall be as noted on the drawings or as selected by the Contracting Officer.

b. Waterproof cement for rubber tile base shall be that recommended or supplied by the manufacturer of the rubber tile base, and approved by the Contracting Officer.

c. Installation. Rubber tile base shall be secured to the walls and partitions with waterproof cement. All joints shall be tight and the base throughout its entire length shall have its top and bottom edges in firm contact with the walls and floor.

10-07. SAMPLES: Before the asphalt tile work is started, samples of materials listed below shall be submitted to the Contracting Officer

for approval before purchase and/or delivery to the site.

Asphalt tile, 3 pieces of size and color specified.
Rubber tile base, 3 pieces of size and color specified.
Primer, one quart.
Adhesive, cut-back and waterproof, one quart each type.
Wax, one pint.

10-08. CLEANING AND WAXING: Floor and base tiles shall be thoroughly cleaned of all cement spots, dirt, and other soiling and shall be left in a condition satisfactory for waxing. Spots shall be removed by means of a putty knife and steel wool, or by a cloth moistened with a neutral soap of a type approved by the manufacturer of the tiles. The use of solvents and wet mopping and washing is prohibited. Two coat of wax shall be applied at the time designated by the Contracting Officer and each coat shall be polished with mechanical or hand buffer.

10-09. PROTECTION: After cleaning, floor and base tiles shall be properly protected until acceptance by a covering of heavy paper, and by board walks in all areas where damage to the floor may occur because of subsequent building operations, and shall be closed to all traffic until adhesive has fully set.

SECTION 11. GLASS AND GLAZING

11-01. SCOPE: The work covered by this part of the specifications, consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of glass, complete, in strict accordance with this part of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

11-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of these specifications and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U.S. Federal Specifications and equivalent Japanese Industrial Standards and in each case that specification requiring the higher standard of quality, performance and safety shall apply.

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
DD-G-451	R-3201	Glass, flat
TT-P-791	K-5592	Putty, oil

11-03. GENERAL: The sizes of glass indicated on drawings are only approximate and the actual sizes will be determined by accurate measurement of the frames. Each pane of glass will be factory labeled. Glazed panels in exterior doors will be wire glass unless otherwise shown in the drawings.

11-04. MATERIALS:

a. Clear window glass shall be supplied in the following minimum thicknesses for corresponding maximum pane sizes:

<u>Min. Thickness</u> <u>(Inches)</u>	<u>Max. Area of Pane</u> <u>(Square feet)</u>
0.087	3.5
0.118	6.45
0.125	7

b. Wire glass, type IIIa shall be 1/4" thick, either clear and polished both side or figured and smooth one side, as selected by the Contracting Officer, the wire used shall be in the form of twisted hexagonal mesh with openings about 1-1/4" x 7/8" of wire diameter not less than 0.02".

c. Putty for wood sash and back putty for doors and fixed glass, shall be white-lead-whiting in a vehicle of boiled linseed oil containing a liquid oil drier of not more than 10 percent.

d. Glazing points shall be 0.035 inch thick galvanized iron placed approximately 9 inches on center, not less than 3 to a side.

11-05. SAMPLES: Samples of all types of size 10" x 12" shall be submitted to the Contracting Officer for inspection and approval prior to purchase and delivery of material to the site.

11-06. PRIMING: Before glazing, sash rabbets and glazing beads will be primed with linseed oil, or a thin mixture of linseed oil and lead, or with zinc base oil paint. Putty will not be primed for painting and will be thoroughly dry before painting.

11-07. INSTALLATION: All glass shall be accurately cut to fit the space glazed. Glass shall be set carefully without springing or forcing and shall be secured as detailed or specified.

a. Clear glass in sliding sash shall be installed from the outside with putty secured with glazing points. Bed and back-puttying shall be solidly packed, free from voids and shall be cut true and straight.

b. Wire glass in exterior doors shall be installed from the outside with metal beads screwed, interior door the same.

11-08. ACCEPTANCE: Glass shall be protected against damage. After inspection, labels and paint smears and spots shall be removed from the glass. Damaged or broken glass shall be removed and replaced before acceptance at no expense to the Government.

SECTION 12. PAINTING: PROTECTIVE, ON METAL

12-01. SCOPE: The work covered by this section of specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with protective painting on metals, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

12-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of this specification:

JIS K-5620 Method of Test for Rust-Inhibiting Paint
JIS K-5622 Paint, Lead-Base; Linseed-Oil, Ready-Mixed

12-03. GENERAL: Unless otherwise specified, all exterior and interior ferrous metal except reinforcing steel, bolts, rough hardware, and metals with non-ferrous coatings shall be given a shop coat of protective paint. Paint shall conform to the requirements of paragraph 12-04 below or subject to the approval of the Contracting Officer, may be a baked-on shop coat of rust-inhibiting paint of a type standard with the manufacturer, provided such coat has proved performance characteristics at least equal to those of the materials specified herein.

12-04. MATERIALS: Paint for exterior and interior metal shall conform to the requirements of JIS K-5620 and K-5622. They shall be the best products of Nippon Paint Company, Ltd., or approved equal.

12-05. APPLICATION: Surfaces to be painted shall be thoroughly cleaned of scale, dirt, and rust by the use of steel scrapers, wire brushes, sand blast, or other equally suitable tools or methods. Oil and grease shall be removed with benzine or other suitable solvent. Paint shall be kept well stirred while it is being applied. No paint shall be used after it has caked or hardened. Paint shall be well worked into all joints and corners. Paint shall not be applied to damp surfaces not when the temperature is below 40 degrees F.

SECTION 1. PAINTING, GENERAL

1-01. SCOPE: The work covered by this part of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the painting and finishing, painting of mechanical equipment in unfinished spaces complete, in strict accordance with this part of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

1-02. ITEMS NOT TO BE PAINTED:

- a. Glass and Mirrors
- b. Plumbing Fixtures
- c. Galvanized Piping or Sheet Metal Work Concealed in Walls
- d. Hardware or Other Trim Which has a Bronze or Plated Metal Finish

1-03. APPLICABLE SPECIFICATIONS:

a. The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U.S. Federal Specifications and equivalent Japanese Industrial Standards and in each case that specification requiring the higher standard of quality, performance and safety shall apply.

b. Outline Specifications for Standard Air Force Facilities, AFM 88-15, dated 1 November 1954.

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
TT-V-51	-----	Varnish, asphalt
TT-P-21	-----	Paint, cement-water
TT-P-61	K5453, 5463	Paint, black
TT-P-102	K5460-5473	Paint, oil, exterior
TT-E-506b	K5480-5489	Paint, enamel, interior
TT-E-508	K5480-5489	Paint, enamel, interior
TT-P-25a	K5591	Paint, primer, exterior wood
TT-P-56a	K5591	Paint, primer, interior wood, plywood
TT-P-86	K5622	Paint, primer, ferrous metals
TT-P-31a	K5622	Paint, primer, ferrous metals
TT-P-641	K5620, 5621	Paint, primer, metal, zinc or zinc coated
TT-V-121c	K5444	Varnish, spar
TT-P-791(II)	K5592	Putty

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
TT-B-251a	-----	Remover, paint & varnish
TT-S-176a	K5534	Sealer, synthetic resin
TT-F-336a	K5533	Filler, wood
TT-P-381	K5101-5214	Pigments-in-oil
TT-B-651a	-----	Drier, liquid
TT-O-356	-----	Oil, flatting & mixing
TT-O-364	K5420, 5421	Oil, linseed, boiled
TT-O-369	-----	Oil, linseed, raw
TT-T-291a	-----	Thinner, oil paint
TT-T-306	K5571, 5572	Thinner, synthetic enamel
TT-T-801	-----	Turpentine
TT-W-251b	K5103	White lead
TT-Z-301	K1411	Zinc oxide
TT-R-191a	K1409	Red lead
TT-S-271a	-----	Shellac

c. Paint described below shall satisfy the following conditions in addition to General Conditons:

(1) Rubber based paint, shall be certified to contain at least 50% of the vehicle solid as rubber, and be applicalbe to one day old paster and seven day old concrete with satisfactory adhesion. within 48 hours after application, shall withstand scrubbing test consisting of 300 fiber brush passes without appreciable change of color, texture or loss of adhesion. Withstand 2% caustic solution and 26 acetic acid solution, contain no turpentine nor other ingredients harmful to food and contain no ingredient upon which bacteria can feed. Film when dry and applied directly on the flame of a bunsen burner will not itself ignite.

11-04. MATERIALS: Painting material shall be equivalent to the best product of the Nippon Paint, Kansai Paint, or Dai-Nippon Torryo Co., Ltd. All materials shall be delivered to the job site in the manufacturer's original sealed containers identifying the brand name and number, and shall be stored as directed until they are necessary for use. The contractor shall submit a color chart from which the Contracting Officer of Construction can select the desired colors. All painting materials shall be mixed at the factory to conform to Federal Specification Standard Color Charts to obtain the color approved by the Contracting Officer of Construction.

11-05. GENERAL CONDITIONS: Paint shall be well ground and capable of being readily mixed to a smooth consistency with good brushing and covering properties. Color pigments shall be pure, non-fading, and finely ground. All paints shall contain an effective amount of fungicidal and mildew-proofing agent which shall prevent

paint from showing a mold growth, when tested in a manner equivalent to that described for mildew resistance in U. S. Federal Specification No. TT-P-18. Color pigments shall be pure, non-fading, and finely ground; and in addition, where surfaces require, shall be lime-proof.

3-06. SAMPLES AND TESTS: Samples of each type of paint, and each color proposed for use shall be submitted to the Contracting Officer for approval prior to application. Samples shall consist of one pint of each kind of paint and three displays of each type and color of paint, applied to wood strips two inches by six inches. In addition, when so directed by the Contracting Officer, contractor shall submit authenticated reports of tests of such material proposed for use as designated by Contracting Officer. Tests shall be in accordance with U. S. Federal Specification No. TT-P-141b.

3-07. MIXING RATIO OF PAINT:

a. Exterior Primer Paint. Ready mixed primer paint for use on exterior wood surfaces will be composed of the following ingredients.

(1) <u>Pigment</u>	<u>Approx. % by Weight</u>
White Lead	50
Titanium dioxide	10
Barium sulphate	40
(2) <u>Vehicle</u>	<u>Approx. % by Weight</u>
Raw linseed oil	30
Boiler linseed oil	25
Resin	3
Thinner and drier	42

b. Exterior Oil Paint. Exterior oil paint will be composed of the following ingredients.

(1) <u>Paint</u>	<u>Approx. % by Weight</u>
Non fading mineral pigment	68
Vehicle	32
(2) <u>Vehicle</u>	<u>Approx. % by Weight</u>
Linseed oil	80
Varnish	10
Drier	10

c. Interior Oil Paint. Interior oil paint, for walls in Toilet Room and Office will be semi-gloss enamel and will be composed of approximately 60 percent non-fading mineral pigment and 40

percent non-volatile vehicle. If necessary, the paint will be thinned to brushing consistency with mineral spirit thinner, using not more than one pint per gallon of paint. The primer coat on wood will consist of interior paint thinned with one pint of raw linseed oil per gallon of paint.

d. Cement - water paint. Cement water paint shall contain no organic binder. It shall be as manufactured by Kowa Kagaku K.K. Yasuda Sangyo Co., Ltd., or approved equal, and shall be composed of the following ingredients.

<u>Materials</u>	<u>Approx. % by weight</u>
White portland cement	80
Hydrated lime	10
Carbonates	3
Titanium	3-5
Water repellant (stearate)	0.5-1
Hygroscopic salts	3-5

4-08. PREPARATION OF SURFACES:

a. General. Except as therewise specified, all surfaces to be painted shall be clean, smooth, dry and free from dust, grit and frost. All work shall be done in a workmanlike manner, leaving the finished surfaces free from drops, rigges, waves, laps, and brush marks. Paint shall be applied under dry and dust-free conditions and, unless otherwise approved by the Contracting Officer, shall not be applied when the temperature is below 50°F, nor when a temperature drop of 20°F., or more is forecast nor when the temperature is over 90°F. All primer and intermediate coats of paint shall be unscarred and completely, integral at the time of application of each succeeding coat. Each coat of paint shall have a slight variation of color to distinguish it from the preceding coat. Sufficient time shall be allowed between coats to insure proper drying. Paints shall be thoroughly stirred and kept at a uniform consistency during application and shall not be thinned in excess of the printed directions of the manufacturer. Paint containers shall not be opened until required for use. Paint may be applied by the spray method except during cold weather or when in the opinion of the Contracting Officer, spraying in any particular application would produce unsatisfactory results. Floors and other adjacent work shall be properly protected by drop cloths or other coverings.

b. Metalwork. Shop-primed metalwork shall be kept clean and free from corrosion following the installation. Abraded surfaces shall be retouched prior to finish painting, using the same type of paint as the priming coat.

c. Woodwork. All millwork and all other woodwork, where required, shall be sandpapered before application of the primer. Small, dry, seasoned knots shall be thoroughly cleaned and scraped, and shall be given a thin coat of orange shellac varnish before the priming coat is applied. Large, open, unseasoned knots and all beads or streaks of pitch shall be heated by a blowtorch and then scraped off, or if the pitch is still soft, it shall be removed with mineral spirits or denatured alcohol. Resulting voids, if any, shall be filled with putty. Nails shall be set. Painting shall proceed only when, in the opinion of the Contracting Officer, the wood is satisfactorily dry.

(1) Priming. All millwork specified to be painted shall be primed on all sides before installation, with particular attention being given to the sealing of cross-grained surfaces. Woodwork other than millwork shall be primed on exposed surfaces only.

(2) Puttying. After the priming coat has been applied nail holes, cracks, and other depressions shall be filled flush with putty, colored to match the finish coat and sandpapered smooth. Putty shall be dry before subsequent painting.

d. Concrete surfaces to be painted shall be prepared by removing all dirt, dust, oil and grease stains, and efflorescence, and by roughening, when necessary, to provide good adhesion for the paint. The method of surface preparation shall be left to the discretion of the contractor, provided the results are satisfactory to the Contracting Officer.

3-09. WORKMANSHIP:

a. General. All painting materials shall be thoroughly stirred or agitated until the ingredients are completely intermixed. Commencement of painting on any surfaces will be construed as contractor's acceptance of surface as ready for painting. Painting on surfaces, unless specified otherwise, shall be 3-coat work, including priming coat. Shop coat, if specified under other sections of these specifications, shall be considered one coat, except for exterior woodwork. Successive coats shall be of slightly different shade to facilitate coverage and inspection.

Exterior millwork shall be primed at mill. Exterior trim and finish woodwork shall be back painted before erection and primed as soon as practicable after erection. All edges, tops and bottoms of doors to be painted shall be painted after necessary fitting is done.

Finished surfaces shall be uniform in gloss, finish and color, and free from laps, brush marks, runs, blisters, cracks and

open joints. Surfaces which do not comply with requirements as to gloss, color, sufficient hiding power, general appearance, relative freedom from brush marks and other objectionable characteristics (in the opinion of the Contracting Officer) shall be repainted by the contractor at his expense as directed by the Contracting Officer.

Hardware, lighting fixtures, switch and receptacle plates, and all similar items shall be removed wherever practicable before painting and replaced after completion of painting. Those items which must remain in place shall be adequately protected during painting operations. Equipment adjacent to surfaces which are to be painted shall be disconnected and moved, if necessary, to provide sufficient room to complete all painting as specified, and shall be replaced upon completion of painting. Removal and replacement of fixtures and equipment shall be done by trades responsible for their installation.

Drop cloths and protective coverings shall be provided to protect floors and work of other trades during painting operations. Paint shall not be left on hardware or other unpainted surfaces, and surfaces on which unauthorized or misplaced paint has been applied shall be cleaned and refinished at contractor's expense.

b. Plywood. Surfaces shall be clean, dry and smooth with joints well-filled and sanded smooth.

10. EXTERIOR PAINTING:

a. Woodwork (Exterior oil paint) Exterior woodwork shall be painted one coat of exterior-primer paint and two coats of exterior oil paint. Exterior woodwork shall include all millwork, frames, doors, sash and similar work. Runs of window frames and edges of sliding sash shall be treated with raw linseed oil. Top and bottom edges of doors, screens, and sash, after fitting, shall be given two coats of spar varnish.

b. Metalwork (Ferrous) - (Red lead and oil paint)

(1) Prime coat. Red lead or iron oxide.

(2) Body coat. Red lead tinted with lamp black if red lead primer used. Iron oxide if iron oxide primer used.

(3) Finish coat. Exterior oil paint, color as directed.

c. Metalwork (Galvanized) (Zinc oxide and oil paint in case required)

(1) Prime coat. Zinc dust-zinc oxide primer.

(2) Body and finish coats. Exterior oil paint, color of finish coat as directed.

10-11. INTERIOR PAINTING:

a. Woodwork (Semi-gloss enamel)

(1) Prime coat. Primer-sealer brushed and cross brushed over all surfaces.

(2) Second and third coats. Semi-gloss enamel; color of finish coat as scheduled. Primer and second coat lightly sanded and surface dusted before succeeding coats.

b. Woodwork (High gloss enamel)

(1) Prime coat. Primer-sealer brushed and cross brushed over all surfaces.

(2) Second coat. Semi-gloss enamel.

(3) Third coat. Gloss enamel, color as directed. Prime and second coats lightly sanded and surface dusted before succeeding coats.

c. Plywood (Semi-gloss oil paint)

(1) Primer-sealer brushed and cross-brushed over all surfaces.

(2) Second and third coats.

Two coats semi-gloss oil paint except that at utility and service areas.

d. Concrete, interior. Two coats of rubber base paint.

e. Buried piping. All steel piping and all exposed threads of galvanized piping, where run in or through concrete, or buried underground, shall be given one coat of an approved asphalt varnish.

f. Pipe covering where shown will be given a heavy coat of glue size, followed by two coats size and to each coat of paint a sufficient amount of a fungicidal agent to render the fabric mildew proof. The fungicidal agent shall be of a type which will not adversely affect the color, texture, or durability of the paint. Color to be as directed by the Contracting Officer.

13-12. EQUIPMENT AND PIPING:

a. Preparation and application. All rust, dirt, scale, grease, and other foreign matter shall be removed and surfaces shall be dry. All specified tests and welding inspection shall have been performed and accepted by the Contracting Officer. All piping and equipment shall be in place with attachments.

b. Surfaces to be painted. All interior exposed ferrous pipe and conduit, fittings and fasteners, pipe covering shall be painted to match adjoining wall or ceiling surfaces, except that at mechanical rooms these items need not be painted. All equipment which does not have a complete factory-finish and which is specified to receive a prime coat in Mechanical and Electrical Specifications, shall receive 2 coats of oil paint in an Air Force gray color or as otherwise directed by the Contracting Officer.

13-13. CLEANING: All cloths and cotton waste which might constitute a fire hazard shall be placed in metal containers or destroyed at the end of each work day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in a manner approved by the Contracting Officer. Paint spots, oil, or stains upon adjacent surfaces shall be removed and the entire job left clean and acceptable to the Contracting Officer.

SECTION 14. FINISH HARDWARE

14-01. SCOPE: The work covered by this part of the specifications consists in furnishing at the site, all Builder's Hardware, complete, in strict accordance with this part of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

14-02. APPLICABLE SPECIFICATIONS: The specifications noted below form a part of this specification and shall be the latest issue in effect on date of invitation for bids. Materials used under this part of the specifications shall meet the requirements of the following U.S. Federal Specifications and equivalent Japanese Industrial Standards and in each case that specification requiring the higher standard of quality, performance and safety shall apply. Precedence of J.I.S. Standards and indigenous materials shall obtain, subject to the approval of the Contracting Officer.

<u>U.S.F.S.</u>	<u>J.I.S.</u>	<u>Material</u>
FF-H-106a	-----	Locks and lock trim
FF-H-111a		Shelf and miscellaneous
FF-H-116b	A-5501-2-10	
	-11	Hinges

14-03. DOORS:a. Butts.

(1) Interior doors. Full-mortised brass-plated steel with loose-pin, button-tips, and self-lubricating bearings, in numbers, sizes and minimum thicknesses as noted in table below.

(a) <u>Door Height (inches)</u>	<u>Butts Required</u>	
60 - 90	3	
90 - 120	4	
(b) <u>Door Thickness (inches)</u>	<u>Door Width (inches)</u>	<u>Butt Size (inches)</u>
1-1/4 to 1-1/2	36 or less	4 x 4 x 0.132
1-3/4	36 or less	4 1/2 x 4 1/2 x 0.134
1-3/4	over 36	5 x 5 x 0.146

b. Locks and latches: All locks and latches shall have bevelled fronts; strikes and bolts standardized to a single mortising pattern for interchangeability with 2-1/2 inches, backset. Cylinder locks shall have armored fronts, not less than 5 pin tumblers and change

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number and set symbol stamped thereon in a concealed location. Case may be cast iron; all other parts, non-ferrous. Construction, in general, shall conform to U.S.F.S. Series 86 for doors 1-3/4 inches thick and heavier, except that types similar to Series 160 shall be acceptable provided the specifications meet the approval of the Contracting Officer.

c. Door holders shall be cast bronze case; steel catch plate and steel or malleable iron plunger rod with rubber tip. Steel parts plated; rubber tip replaceable. Size approximately 7 inches overall height; minimum throw of plunger, 1 inch.

d. Chain and foot bolts.

(1) At interior doors - 4" wrought steel, brass plated, round or square case.

<u>Length of Bolt</u> <u>(inches)</u>	<u>Minimum Thickness</u> <u>of Plate (inches)</u>
6	0.064
8	0.064
10	0.072

e. Coat hooks shall be cast bronze with 3 inch projection, bent upper prong, 2 screws.

14-04. HORIZONTAL SLIDING SASH:

a. Pulls. Plated wrought steel, approximately 1-3/4" x 3" flush sash lift type with beveled edges, square outside corners, side screw holes, surfaces smooth and free from sharp or rough edges.

b. Fasteners. Cast or wrought bronze screw bolts of approved manufacturer.

c. Sheaves & track. For sliding sash shall be furnished in brass for bottom of sash application.

<u>Weight of Sash</u> <u>(lbs.)</u>	<u>Size of Sheave</u> <u>(diam. inches)</u>	<u>Size of Track</u> <u>(inches)</u>
20	1-1/4	7/32 x 8/32
60	1-1/2	8/32 x 9/32
100	1-3/4	9/32 x 10/32

Track shall be rounded bar type, to fit for corresponding sheaves.

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14-05. INSTALLATION OF HARDWARE:

a. Doors.

(1) Butts. Top hinge, 5 inches from jamb head to top of barrel; bottom hinge 10 inches from finish floor to bottom of barrel; other hinges equidistant between top and bottom hinges.

(2) Locks, latches and strikes. Center of knobs 43 inches above finish floor, strikes perfectly matched to bolts.

(3) Door pulls. Middle of grip 45" above finish floor.

b. Windows.

(1) Sash pulls. At center of side stiles.

(2) Fasteners. At center of meeting stiles.

14-06. KEYS AND KEYING: Two keys shall be provided for each lock; locks shall be master-keyed and grand-master-keyed, and tagged, as directed by the Contracting Officer.

14-07. PATTERNS AND FINISHES: All finish hardware items shall be furnished in plain patterns. Brass finish items shall be furnished in bright polished brass, clear lacquer coated.

14-08. SAMPLES: Samples of all items of finish hardware shall be submitted for the approval of the Contracting Officer.

14-09. CONTRACTORS HARDWARE SCHEDULE: Subsequent to the approval of samples, and prior to the delivery of finish hardware, the contractor shall prepare and submit to the Contracting Officer, four (4) copies of a complete schedule of all finish hardware necessary to the completion. Type numbers described in the specification are mentioned in United States Federal Specification. Those items of Japanese manufacture which conform to the above will be approved by the Contracting Officer.

14-10. PACKAGING AND MARKING: Each item of hardware, complete with necessary screws, keys, instructions and installation template shall be packaged separately in individual containers. Each container shall be marked with item number corresponding to number shown on Contractor's Hardware Schedule.

NOTES: 1. Hardware in any one room or space shall be consistent in finish.

2. Screws and other fastenings shall be of the proper types and materials of the same finish as the related hardware.

3. Wherever this specification calls for cast or wrought bronze, cast or wrought brass may be used in lieu thereof.
4. It is the contractor's option to furnish hardware items specified as "Steel, Brass Plated" to furnish those items in brass.

14-11. REPAIR AND REPLACEMENT: All existing hardware which does not function properly shall be repaired or replaced with new hardware as directed by the Contracting Officer. New hardware shall match the existing hardware as to type, material and finish.

14-12. HARDWARE SCHEDULE: Door targets on drawings under cross line indicate hardware set numbers which designate hardware set for that door.

Set #1	Butts - 3 pairs, exterior type Chain and foot bolt - 1 ea - type 1201A & B Lockset 86A-4 Door closer - 1, type 3000, size III Door holders - 2, type 1149
Set #2	Butts - 3 pairs, interior type Chain and foot bolt - 1 ea - type 1201A & B Lockset 86D-4 Door closer - 1, type 3000, size III Door holders - 2, type 1156
Set #3	Butts - 3 pairs, interior type Chain and foot bolt - 1 ea - type 1201A & B Lockset 86M-4 Door closer - 1, type 3000, size III Door holders - 2, type 1156
Set #4	Butts - 3 pairs, exterior type Chain and foot bolt - 1 ea - type 1201A & B Lock - type 192A Friction catch - 1, type 1070 Door pulls - 4, type 1275 Door holders - 2, type 1149
Set #5	Butts - 3, interior type Lockset 85D-4 Door closer - 1, type 3000, size III Door holder - 1, type 1156

Set #6	Butts - 3, interior type Lockset 86M-4 Door closer - 1, type 3000, size III Door holder - 1, type 1156
Set #7	Butts - 3, interior type Latchset 86N-4 Door closer - 1, type 3000, size II Door holder - 1, type 1156
Set #8	Butts - 3, interior type Lockset 86J-4 Door holder - 1, type 1156

Type numbers described above are mentioned in U.S. Federal Specification. Those items of Japanese manufacture which conform to the above will be approved by the Contracting Officer.

SECTION 15. PLUMBING

15-01. GENERAL REQUIREMENTS: The work covered by this section consists in furnishing all labor, appliances and materials, and in performing all operations in connection with plumbing, including the replacement of all cold and hot water piping and all changes affected by raising the floor levels, complete, in strict accordance with this section of the specifications and the applicable drawings.

15-02. MATERIALS AND EQUIPMENT: All materials and equipment shall be of Japanese products wherever possible, and shall comply to applicable Japanese Industrial Standards (JIS) or Japanese Engineering Standards (JES) if in the scope thereof. Material and equipment complying to JIS shall carry the JIS approved markings and shall be of products of reputable JIS approved manufacturers.

a. All Cast-Iron Soil Pipe and Fittings shall meet all requirement of the Japanese Society of Sanitary Engineers. All pipe and fittings shall be of standard weight and shall be coated with coal tar.

b. Steel Pipe. Steel pipe standard weight, seamless galvanized pipe and shall comply with the requirements of JIS G-3427.

c. Fittings.

(1) Drainage Fittings. Cast-iron screwed or hub drainage fittings shall be coated, made of high-grade commercial, grey cast-iron.

(2) Malleable Iron Fittings. Malleable iron screwed fittings shall be 250 psi (175 kg/cm²), class, galvanized of commercial grade malleable iron, heat treated so as to be strong, tough and of even grain. These fittings shall comply with the requirements of JIS B-2311.

(3) Nipples shall be of the same materials and class as the pipe system in which they are used.

(4) Unions shall be malleable iron galvanized with a high type ground joint.

(5) Pipe flanges. Pipe flanges shall be cast iron or cast steel, galvanized with true faces.

(6) Gaskets. Flange gaskets shall be the best quality asbestos, fiber, plastic or leather.

d. Calking Lead. Calking lead shall be processed pig lead, and shall conform to the requirements of JIS H-2105.

e. Twisted Jute Packing. Twisted jute packing shall conform to the requirements of JIS specifications. Type II (tarred) shall be used for calking cast-iron soil, or concrete pipe when joints are sealed with lead or cement-mortar.

f. Insulation. Insulation shall be wool-felt, antisweat type, not less than 3/4 inch in thickness, sectional removable type, lined with asphalt-saturated asbestos paper and fabricated of either solid wool.

15-03. EXISTING PIPING, FIXTURES AND EQUIPMENT: When raising the floor level, all fixtures shall be disconnected and reinstalled. This work shall be done by skilled laborers in a workmanlike manner to the best standard of the trade. All the plumbing fixtures shall be tightly covered and protected against dirt, water and chemical or mechanical injury. Pipe openings shall be closed with caps or plugs during installation. At the completion of the work, the fixtures, materials and equipment shall be thoroughly cleaned in a condition satisfactory to the Contracting Officer.

15-04. PIPING INSTALLATION REQUIREMENTS:

a. Underground:

(1) Soil waste and drain pipe. All underground soil, waste and drain pipe to a point at least 6 inches above the finished floor line shall be cast-iron pipe and fittings. Lead pipe connections to waste outlet of any fixtures shall be used only where specifically approved by the Contracting Officer.

(2) Water Service. All underground water service lines shall be galvanized steel and cast-iron flanges water pipe and fittings. Pipe larger than 3 inch shall be cast-iron. All underground water service line 2-1/2 inch and smaller shall be galvanized seamless steel pipe with malleable iron threaded fittings.

b. Aboveground.

(1) Soil, Waste, Drain and Vent Piping. All above ground soil, waste, and drain piping shall be lead or galvanized steel pipe as required. All vent pipes shall be lead or galvanized steel pipe as fittings except that for dry vents malleable-iron pipe fittings may be used.

(2) Water Piping. All water distribution piping shall be galvanized seamless steel pipe. All pipe fittings shall be malleable iron galvanized.

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15-05. SOIL, WASTE, DRAIN AND VENT PIPING:

a. Joints.

(1) Cast-Iron Pipe. Joints in bell-and-spigot, cast-iron soil, waste, and vent pipes, or between cast-iron soil, waste, and vent pipes and threaded pipe or calking ferrules, shall firmly packed with oakum or hemp and calked with lead at least one inch deep.

(2) Threaded Pipe. Threaded joints shall have proper taper screw threads in accordance with JES specifications, with graphite and oil compound applied to the male thread. Connections between threaded pipe and soil pipe shall have a rink or half coupling screwed on to form a spigot end.

15-06. FLASHINGS: Vent pipes shall be flashed and made watertight at the roof with a galvanized No. 26 gage (0.0179 inch in thickness) adjustable roof flange. Roof flashing shall be adjustable from flat to 45 degrees and shall be provided with a clamp to securely fasten the collar to the vent pipe. Flashing shall extend not less than 8 inches from the vent pipes in all directions.

15-07. FLOOR DRAINS: Floor drains shall be made of high-grade, strong, tough and even-grained metal. Castings shall be free from blowholes, porosity, hard spots, excessive shrinkage, cracks or other injurious effects. They shall be smooth and well cleaned both inside and outside, and all fins and roughness shall be removed. Castings shall not be repaired, plugged, brazed or burned in. The wall thickness of iron castings shall be not less than 1/4 inch. The size of the drains shall be determined by the branch sizes indicated on the drawings.

15-08. WATER PIPE, FITTINGS, AND CONNECTIONS:

a. Installation. A gate valve and drain on the service line shall be installed inside the building. The piping shall be extended to all fixtures, outlets, and equipment from the gate valve. The cold-water system shall be installed with a fall toward the shut-off valve. Outlets shall be capped or plugged as indicated on the drawings, and left ready for future connections.

(1) Mains, Branches, and Runouts. Pipe shall be cut accurately to measurements established at the building by the contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping above ground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branch pipe

from service lines may be taken off top of main, bottom of main, or side of main using such cross-over fittings as may be required by structural or installation conditions. Service pipe, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering and other work and not less than 1/2 inch between finished covering on the different services. No water piping shall be buried in floors unless specifically indicated on drawings or approved. Changes in pipe sizes shall be made with reducing fittings. The use of long screws and bushings will not be permitted.

(2) Pipe drains indicated on the drawings shall consist of 1/2 inch globe valves with renewable disks and 3/4-inch hose nipples. Additional drains shall be installed at low points on the hot-water piping, and all piping shall grade down to the drains.

(3) Expansion and Contraction of Piping. Allowance shall be made throughout for expansion and contraction of pipe. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided toward the ends.

b. Joints.

(1) Threaded Pipe. After cutting and before threading, pipe shall be reamed and shall have burs removed. Screw joints shall be made with graphite or inert filler and oil or with an approved graphite compound applied to male threads only. Threads shall be full-cut, and not more than 3 threads on the pipe shall remain exposed. Calking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be provided where required for disconnection. Threaded swing joints shall be used for branch connections to risers and mains.

(2) Flared, Sweated, and Brazed Pipe and Tubing. Tubing shall be cut squares, and burs shall be removed. Both side of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard-drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with a noncorrosive paste flux and solid string or wire solder composed of 40 percent tin and 60 percent lead. Cored solder will not be permitted. Joints for flared-type fittings shall be of the compression pattern. Brazed joints shall be made with silver solder. Threaded swing joints shall be provided on all branch connections to mains and risers to provide for expansion and contraction of tubing.

(3) Sterilization. The entire water-distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine conforming to U. S. Army Specification 4-1, or sodium hypochlorite solution conforming to Federal Specification O-B-441, grade D, and shall be introduced into the system in a manner approved by the Contracting Officer. The sterilizing solution shall be allowed to remain in the system for a period of 8 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million, unless otherwise directed.

7-09. INSULATION:

a. Pipe Covering shall be 3/4 inch thick nonconducting mineral wool as shown on the drawings. Hot-water, hot-water-circulating, and cold-water piping shall be cleaned and covered after satisfactory tests have been completed. Branches to fixtures installed in finished rooms shall not be covered. Straps shall be placed over the covering not over 18 inches apart. At each elbow there shall be two and at each tee there shall be three bands. Covering shall be neatly finished where pipe hangers occur. Fittings and valves shall be covered with plastic material containing not less than 85 percent magnesia or asbestos finished with a hard smooth surface flush with pipe covering. Where the fixture branches are exposed and drop from overhead, the covering shall stop on vertical pipes 6 feet above the floor, and supplies from this point to fixture shall not be covered. A ceiling plate shall be installed at point where covering stops. No unions of any kind are to be covered, and covering shall be neatly terminated on each end of such unions with plastic material.

7-10. PIPE SLEEVES, HANGERS, AND FIXTURE SUPPORTS: Furnish and set in proper permanent locations, pipe sleeves, pipe hangers, pipe supports and fixture supports.

a. Pipe Sleeves. Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through walls, floors, partitions and footings. Pipe sleeves, except sleeves in footing, shall be of sufficient diameter to provide approximately 1/4 inch clearance around the pipe and, in the case of insulated pipe, approximately 1/4 inch clearance around the insulation. Pipe sleeves in footings shall be of cast iron or steel pipe and shall be not less than 2 inches larger in diameter than the pipe to be installed. Pipe sleeves through walls above grade, floors and partitions shall be of twenty (20) gage galvanized sheet iron. Sleeves in floors shall extend not less than one inch nor more than 2 inches above the finish floor and after installation of the pipe, the space around the pipe shall be calked with oakum and elastic cement.

b. Pipe Hangers. Hang horizontal piping securely with perforated hangers or strap iron spaced not over 10 feet on centers. Support all vertical piping passing through floors by friction-type straps at each floor.

c. Fixture Supports. Where fixtures are supported on frame walls or partitions, provide ample backing. Use steel screws for fastening fixtures to wood partitions.

15-11. FLOOR, WALL, AND CEILING PLATES: Uncover exposed pipes, where passing through floors, finished walls, or finished ceilings, shall be fitted with chromium-plated or enameled plates. Plates shall be square, octagonal, or round, with the least dimension not less than 1-1/2 inches larger than the diameter of the pipe. Plates shall be secured in an approved manner.

15-12. TESTS: All soil waste, vent and water piping shall be tested by the Contractor and approved by the Contracting Officer before acceptance. All soil or waste pipe located underground shall be tested before backfilling. All equipment required shall be tested before backfilling. All equipment required for test shall be furnished by the contractor. If inspection or test shows defects, such defective work or material shall be replaced and inspection and tests repeated. All repairs to piping shall be made with new materials. No calking of screwed joint or holes will be acceptable.

15-13. LABORATORY SINKS: Laboratory sinks shall be 16 U.S. Standard Gage (.060 inches) corrosion resisting steel conforming to the requirements of Federal Specification QQ-S-766a, Class 7 (type 430) unless otherwise specified. Tops shall be reinforced with heavy longitudinal steel channels running the entire length of tops, except at sink openings. Tops and/or drainboards, rims and backs shall be formed from one sheet of metal. Drainboards shall pitch toward sink and shall be sound deadened by approved methods. Intersections where back splash and return and splash meet drainboard or top shall be rounded to a 1/4-inch radius. Thickness of back returned ends shall one inch. All tops shall have edges folded down and returned with a total overall thickness of 1-1/4 inches. Edges where sink bowls and drainboards meet shall be rounded to a 3/8-inch radius. All corners of sink bowls shall be rounded to a 1-3/4 inch radius.

15-14. COMPRESSED-AIR PIPING: Compressed-air piping shall be installed as specified for water piping, except that insulation of piping will not be required. Drip pockets shall be provided at low points for eliminating moisture and collecting scale. Sharp bends or elbows shall be avoided where possible to keep friction at a minimum.

a. Compressed-air piping shall be plain-steel or wrought-iron, and fittings shall be malleable-iron, for 150 pounds per square inch working pressure, except that piping below the first floor shall be wrought iron with butt welding fittings.

b. Compressed air valves shall be globe valves except that where plug valves are shown on the drawings the plug valves shall be cast-iron body, threaded ends suitable for 150 pounds per square inch working pressure. The plug shall be brass or iron with an integral level.

c. Compressed-air balancing receiver shall be vertical type, sized as shown on the drawings and shall be complete with inlet, plugged outlet, valved drain, safety valve, and pressure gage connections and accessories. The receiver shall be stamped for 200 p.s.i.g. air service and shall be constructed in accordance with the ASME Code for Unfired Pressure Vessels.

d. Compressed-air piping under first floor slab, after being tested and accepted as leakproof, shall be wrapped and coated.

(1) Pipe shall be thoroughly cleaned of scale with scrapers and wire brushes after which the surfaces shall be cleaned of grease and oil with naphtha.

(2) Priming coat, consisting of coal-tar pitch and refined coal-tar oils suitably blended to produce a liquid coating which can be applied cold and which will effect a firm bond between the metal and the subsequent coating of enamel, shall be applied in accordance with the manufacturer's instructions and allowed to dry hard to the touch.

(3) Enamel coat, consisting of a processed coal-tar pitch combined with an inert mineral filler to produce a waterproof, adhesive surface, shall be applied hot in strict accordance with the recommendations of the manufacturer and in a manner to produce a smooth surface, free from pinholes, honeycomb, ridges, and sags. The coating shall be 3/32-inch thick plus or minus 1/32-inch and shall be allowed to dry sufficiently to avoid distortion from subsequent operations.

(4) A single wrapping of 15 pound asbestos pipe line felt shall be applied over the enamel coating in an approved manner to provide a smooth, uniform and securely bonded wrapper without air pockets or spaces. The felt shall be applied with side laps not less than one sixteenth the width of the felt used but not less than 1/4-inch, and with end laps not less than 10 inches. During the wrapping operation enamel shall be applied in a manner that will bond thoroughly the felt to the surface under it. At joints and fittings the wrappers shall be bonded to the enamel and shall overlap the wrappings on the pipe at least 6 inches with all laps cemented carefully with enamel.

(5) After thorough hardening of the enamel bond and cementing, the surfaces shall be wrapped closely with 80 pound kraft paper which shall be sealed and secured with enamel or an approved cement.

(6) Factory wrapped lengths of pipe will be permitted provided that the joints are left exposed for testing.

15-15. ELECTRICAL WORK: Manual or automatic control and protective or signal devices required for the operation of the heating equipment herein specified but not shown on the electrical plans shall be furnished and installed under this section of the specifications. Wiring required for the operation of the heating equipment but not indicated on the electrical plans shall be furnished and installed under this section of the specifications in accordance with ELECTRICAL WORK: INTERIOR.

15-16. PAINTING AND FINISHING: Ferrous metal not requiring finish painting, such as pipe supports and uninsulated piping outside finished rooms, shall be thoroughly cleaned and given one coat of asphalt varnish. Unless otherwise specified, ferrous metal specified to receive finish painting shall be primed as specified in PAINTING: PROTECTIVE, ON METAL. Pipe covering concealed or installed external to finished rooms shall be given a coat of glue sizing and two coats of lead-and-oil paint in a color selected by the Contracting Officer. The finish painting of heating units, and piping or pipe covering exposed in finished rooms is covered under PAINTING.

15-17. OPERATION AND MAINTENANCE INSTRUCTIONS: Printed instructions covering the operation and maintenance of each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than 1 day to instruct a representative of the Government in the operation and maintenance of the heating system.

15-18. INSPECTION AND TESTS:

a. Tests for plumbing systems: Soil, waste, vent, compressed air and water piping shall be tested by the contractor and approved by the Contracting Officer before acceptance. All piping located underground shall be tested before backfilling and/or wrapping. Equipment required for tests shall be furnished by the contractor.

(1) Drainage system.

(a) Water test. The entire drainage and venting system shall have necessary openings plugged to permit the

entire system to be filled with water to the level of the highest vent stack above the roof. The system shall hold this water for 30 minutes without showing a drop greater than 4 inches. Where a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system, except that a vertical stack 10 feet above the highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure, or a pump may be used to supply the required pressure. The pressure shall be maintained for 30 minutes.

(b) Air test. If tests are made with air, a pressure of not less than 5 pounds per square inch shall be applied with a force pump and maintained at least 15 minutes without leakage. A mercury-column gage shall be used in making the air tests.

(c) Final test. The final test of the completed drainage and vent system may be either a smoke or peppermint test. Where the smoke test is employed, the smoke shall be produced by a smoke machine and a pressure equal to 1-inch water column shall be maintained for 15 minutes before starting inspection. Where the peppermint test is preferred, 2 ounces shall be introduced into each line or stack. Defects discovered shall be eliminated by resetting the fixtures and equipment with new gaskets.

(2) Water system. Upon completion of the roughing-in and before setting fixtures, the entire hot-and-cold-water piping systems shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gage, and proved tight at this pressure for not less than 30 minutes in order to permit the inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately in the same manner as described for the entire system.

(3) Compressed-air system. Compressed-air piping shall be tested at a minimum air pressure of 225 pounds per square inch and proved tight at this pressure for a length of time that will permit inspection of all joints.

(4) Defective work. If inspection or test shows defects, such defective work or material shall be replaced and inspection and tests repeated. Repairs to piping shall be made with new material. No calking of screwed joints or holes will be acceptable.

(5) Cleaning and adjusting. At the completion of the work, all parts of the installation shall be thoroughly cleaned. Equipment, pipe, valves, and fittings shall be cleaned of grease and metal cuttings, and sludge which may have accumulated by operation of the system for testing. Any stoppage of discoloration of other damage to parts of the building, its finish, or furnishings, due to the contractor without cost to the Government. At the completion of the work,

the hot-water system shall be adjusted for uniform circulation. Flush valves and other parts of the work shall be adjusted for quiet operation. Automatic control devices shall be adjusted for proper operation.

SECTION 16. INTERIOR HEATING SYSTEM

16-01. SCOPE: The work covered by this section of the specifications consists of furnishing all labor, equipment, and materials and in performing all operations in connection with the installation of the Steam Heating System, complete, in strict accordance with this part of these specifications and the applicable drawings, and subject to the terms and conditions of the contract.

16-02. GENERAL: The contract drawings indicate the extent and general arrangement of the heating system. If any departures from the contract drawings are deemed necessary by the contractor details of such departures and the reasons therefor shall be submitted as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer.

16-03. MATERIALS AND EQUIPMENT: The following materials and equipment shall conform to the respective specifications and other requirements specified below:

a. Asphalt varnish. Asphalt varnish shall be composed of native asphalt or asphaltics, fluxed and blended with drying oils, and thinned with solvents and necessary driers. Asphalt varnish shall conform to the requirements of JIS K-5445, Class A.

b. Pipe. All heating system piping shall be seamless steel pipe of the standard weight and shall conform to the requirements of JIS G-3421.

c. Pipe fittings.

(1) Malleable iron fittings. They shall be 10 kg/cm² class, black, commercial grade and shall conform to the requirements of JIS B-2301.

(2) Flanges. Flanges of the design called for on the drawings shall conform to the applicable JIS requirements.

(3) Nipples. Nipples shall be seamless steel pipe and shall conform to the requirements of JIS B-2301.

(4) Unions. Unions shall be of the class and type to meet the pressure requirements and shall conform to the requirements of JIS B-2301.

d. Valves.

(1) Gate valves, threaded. They shall be all bronze conforming to the requirements of JIS B-2023.

(2) Globe valves, threaded. They shall be all bronze conforming to the requirements of JIS B-2021.

(3) Check valves. They shall be all bronze conforming to the requirements of JIS B-2025.

e. Gaskets. Gaskets shall be made of asbestos packing of the type and thickness (1/16 inch minimum thickness) suitable for the service intended as shown on the drawings. They shall conform to the requirements of applicable JIS.

f. Mechanical equipment. Major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a name plate securely affixed in a conspicuous place. The name plate of a distribution agent only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

g. Electrical materials and appliances. ELECTRICAL WORK, INTERIOR of these specifications.

16-04. WORKMANSHIP: Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

16-05. PRESSURE GAGES: Pressure Gages of an approved Bourdon Spring type shall be installed as indicated on the drawings. Gages shall be installed in such manner as to be accessible and easily read. Gage dials shall be set in iron cases with baked-enamel finish. Gages shall be equipped with integral or separate siphons, and shall be connected by brass pipe and fittings with shut-off cocks. The gages shall have a minimum dial diameter of 4-1/2 inches and a pressure range of 0 to 100 psig.

16-06. SAFETY VALVES: Suitable pop safety valves shall be installed in the steam lines at the locations as indicated on the drawings. They shall be set to open automatically and relieve steam at the pressure as specified. All the safety valves shall conform to the requirements of applicable JIS.

16-07. PIPING: Pipes shall be cut accurately to measurements established at the building, and shall be worked into place without springing or forcing properly clearing all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Pipe shall have burs removed by reaming. Changes in direction shall be made with fittings, except that bending of pipe will be permitted, provided a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformations will not be acceptable. Unless otherwise indicated, horizontal supply mains shall pitch up in the direction of flow and return mains shall pitch down in the direction of flow, with a grade of not less than one inch in 40 feet. Open ends of pipelines and other equipment shall be properly capped or plugged during installation to keep dirt or other foreign material out of the system. Pipe not otherwise specified shall be uncoated.

a. Branch connections. Branches from the mains shall be taken off at an angle of 45° above or below the horizontal, unless otherwise indicated on the drawings. Connections shall be carefully made to insure unrestricted circulation, eliminate air pockets, and permit the complete drainage of the system. Branches taken from the tops of mains shall pitch up, and those taken from the bottom shall pitch down from the mains, with a grade of not less than one inch in 10 feet (unless otherwise shown).

b. Risers. The locations of risers shown on the drawings are approximate. Exact locations of the risers shall be as approved by the Contracting Officer.

c. Joints. Screw joints shall be made with tapered threads properly cut. Screw joints shall be made perfectly tight with a stiff mixture of graphite and oil, or equal, applied with a brush to the pipe threads only, and in no case to the fittings. Flanged joints shall be faced true, packed, and made up perfectly square and tight.

d. Pipe supports. Horizontal runs of pipe shall be securely supported. Suspended pipe shall (unless otherwise shown) be held by adjustable expansion pipe hangers having threaded rods and turnbuckles, where space permits. Pipe in unexcavated areas beneath buildings shall be hung from above. Supports for pipes shall be spaced 10 feet on center (approximately).

e. Anchors. Pipe anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise shown on the drawings. Anchor braces shall be

installed in the most effective manner to secure the desired results. No supports, anchors, or stays shall be attached in places where they will injure the construction either in installing or by the weight or expansion of the pipe line. Detailed drawings of pipe anchors shall be submitted for approval before installation.

f. Pipe sleeves. Unless otherwise indicated pipes passing through masonry construction shall be fitted with sleeves. Each sleeve shall extend through its respective floor or wall, and shall be cut flush with each surface unless otherwise required. Unless otherwise specified, sleeves shall be two pipe sizes larger in diameter than the passing pipe when uncovered, and one pipe size larger than the over-all outside diameter of the pipe when insulated. Sleeves in bearing walls shall be made of steel or terracotta pipe. Sleeves in other masonry walls shall be 20 gage metal, fiber or other approved materials. Sleeves shall be properly installed and securely cemented in place.

g. Floor, wall and ceiling plates. Pipes passing through the floors, walls and ceilings of finished room shall be fitted with floor, wall, or ceiling plates, securely fastened in place. Where pipes pass through combustible materials, the openings shall be sufficiently large to provide 1 inch clearance between the pipe and the floor or partition.

16-08. HEATING UNITS: The drawings indicate the general location, sizes and type of heaters. Central factory test reports shall be furnished to the Contracting Officer for all newly installed heating units.

1. Unit heaters.

(1) General. Unit heaters shall be of the propeller type, suspended from the roof structural members and arranged for horizontal discharge. Casings shall be solid and rigid with a factory finish of a color approved by the Contracting Officer. Heaters shall have a BTU capacity not in excess of 125 percent of that specified. Balancing cocks shall be provided to reduce or regulate the BTU outputs. The unit heaters shall be quiet in operation. Upon completion of installation, unit heaters where are considered by the Contracting Officer to be objectionably noisy shall be replaced with acceptable heaters at no additional cost to the Government.

(2) Heating elements. Heating elements, made of a suitable non-ferrous alloy, shall be free to expand or contract without developing leaks and shall be properly pitched for drainage. The elements shall be tested under a hydrostatic pressure of 200 p.s.i.g.

(3) Motors. Motors shall be provided with three-position manual selection switches for "ON" "OFF" and "AUTOMATIC" operation, shall be equipped with thermal-overload protection, and shall be of suitable size and speed to operate the fans at their specified capacities.

(4) Thermostatic control. The unit heaters shall be controlled automatically by thermostats located where shown on the drawings. The thermostats shall be adjustable and fitted with thermometers. Each thermostat shall operate on not more than a 3-degree F. differential over a temperature range of approximately 55 to 85 degree F. The thermostat shall start or stop the respective unit heater fan motor when the room temperature falls below or rises above the predetermined points.

b. Relocation of steam radiators. Existing radiators shall be relocated at the locations indicated on the drawings. The radiators shall be carefully removed to insure no loss for breakage or disfigurement. All broken or disfigured parts will be replaced by the contractor with no additional cost to the Government.

16-09. PRESSURE REDUCING VALVES: Pressure reducing valves shall be installed at the locations shown on the drawings. The valves shall be the standard product of a reputable manufacturer and shall be rated at not less than the capacity shown on the drawings. Each valve shall be operated by means of a diaphragm or piston and spring and have a regulation such that the delivered pressure will not vary more than 1 p.s.i.g. from the desired terminal pressure, regardless of fluctuations in main line pressure. All parts subject to wear shall be renewable. The valves shall reduce and regulate steam main pressure down to pressures indicated on drawings. Valve bodies shall be iron or bronze, screwed or flanged, and suitable for working pressure of not less than 125 p.s.i.g. The valves may have either a remote or an integral pilot.

16-10. STEAM TRAPS:

a. Steam bucket traps. Inverted bucket type steam traps or vertical bucket type traps with automatic air discharge, designed for a working of 150 p.s.i.g, shall operate under a steam supply pressure of approximately 20 to 75 p.s.i.g. as required. Each trap shall discharge into the medium pressure return main. Each trap shall have a heavy body and cap of fine-grained gray cast iron. The bucket shall be made of brass or equally serviceable material, and the mechanism shall be of hard bronze. The valve and seat shall be constructed of corrosion-resistant metal. The traps shall be tested hydrostatically and proved tight under a gage pressure of 200 p.s.i.g. Traps shall have capacities as shown on the drawings when operating under the specified working conditions. A suitable strainer shall be installed in the suction connection to each trap.

b. Float-thermostatic steam trap. A float-thermostatic steam trap shall be installed at the discharge end of the flash leg. The trap shall be designed for a steam working pressure of 15 psig. but shall operate with a supply pressure as shown on the drawings when operating under the specified working conditions. Each trap shall be provided with a mechanism and valve seat of hard bronze and a float of brass all of which shall be easily removable for inspection or replacement without disturbing the piping connections. The inlet to each trap shall be provided with a brass strainer either as an integral part of the trap or as a separate piece of equipment..

16-11. STRAINER: Basket or "Y" type strainers shall be of the same size as the pipe lines in which they are installed. The strainer bodies shall be heavy and durable, of the best grade gray cast iron, with bottoms drilled and plugged. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow and the working pressure. Each strainer shall be equipped with an easily removable cover and sediment basket. The basket shall be of not less than 0.025 inch thick sheet brass, having perforations to provide a net free area through the basket of at least 4 times that of the entering pipe. The flow shall be into the basket and out through the perforations.

16-12. INSULATION: Piping for both steam and condensate lines except branch piping in heated rooms, shall be insulated with pipe covering of 1" magnesia. Covering shall be held in place with metal strips not less than 3/4-inch wide. Strips shall be spaced to hold the center and ends of each section and in no case shall the spacing exceed 18 inches. Valves and fittings except unions and flanges, shall be covered with magnesia cement of the same thickness as the pipe covering.

16-13. FLASH LEG: A flash leg shall be installed when indicated on the drawings and shall be constructed as shown on the drawings or as recommended in the Heating, Ventilating and Air Conditioning Guide of the American Society of Heating and Air Conditioning Engineers. The discharge line shall be equipped with a float and thermostatic trap. The vent pipe shall be galvanized steel and the fittings shall be galvanized malleable iron. The vent shall be extended through the roof as directed by the Contracting Officer and shall be properly flashed.

16-14. CONNECTIONS TO EXISTING MAINS: All the steam and condensate piping and conduits shall be connected to existing mains.

16-15. ELECTRICAL WORK: Manual or automatic control and protective or signal devices, required for the operation of the heating equipment herein specified but not shown on the electrical plans, shall be furnished and installed under this section of the specifications. Wiring required for the operation of the heating equipment but not indicated on the electrical plans shall be furnished and installed under this section of the specifications, in accordance with ELECTRICAL WORK, INTERIOR.

16-16. PAINTING AND FINISHING: Ferrous metal not requiring finish painting, such as pipe supports, shall be thoroughly cleaned and given one coat of asphalt varnish. Unless otherwise specified, ferrous metal specified to receive finish painting shall be primed as specified in PAINTING, PROTECTIVE, ON METAL. Pipe conduits exposed to air shall be given a coat of flue sizing and two coats of lead-and-oil paint in color selected by the Contracting Officer. The finish painting on radiators or piping exposed in finished rooms is covered under painting.

16-17. TESTS: The whole heating system shall be tested and proved tight under a pressure of 40 p.s.i.g. Upon completion and prior to acceptance of the installation the contractor shall subject the heating system to such operation tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating effectively operating tests shall cover a period of not less than 6 hours for each system and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities, and labor required to properly conduct the test shall be provided by the contractor at no additional cost to the Government, and all steam, water and electricity required will be furnished by the Government. The contractor shall be responsible only for the portion of system which is covered in this contract.

SECTION 17. AIR-CONDITIONING SYSTEM

17-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and in performing all operations in connection with the installation of the air-conditioning system, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

17-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of this specification:

a. Japanese Industrial Standards.

JIS B-2023	Valves, Bronze, Gate; 125- and 150-Pound, Screwed and Flanged.
JIS B-2025	Valves, Bronze; Check and Globe, 125- and 150-Pound, Screwed and Flanged.
JIS B-2301	Pipe Fittings.
JIS G-3302	Iron and Steel; Sheet, Galvanized.
JIS G-3427	Pipe; Steel, Galvanized (10 kg/cm ² Class)
JIS H-3601	Tubing, Copper, Seamless (for use with Solder-Joint or Flared-Tube Fittings).
JIS L-1001	Canvas, Linen, Impregnated.
JIS L-1019	Duck; Cotton, Plied-Yarns.
JIS Z-9504	Mineral-Wool, Impregnated; Blanket, Block, and Pipe Covering.
JIS Z-9506	Insulation; Magnesia, 85%.
JIS K-5445	Varnish; Asphalt.

b. American Society of Refrigerating Engineers' Standard.

No. 15 Safety Code for Mechanical Refrigeration.

c. National Board of Fire Underwriters Pamphlet.

No. 90 Air Conditioning, Warm Air Heating, Air Cooling and Ventilating Systems.

17-03. GENERAL: The contract drawings indicate the extent and general arrangement of the air-conditioning system. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted as soon as possible to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer. The air-conditioning system shall conform to Pamphlet No. 90 of the National Board of Fire Underwriters. The dimensions of the mechanical-equipment room are as indicated on the

drawings. Equipment and piping arrangements shall provide adequate and acceptable clearances for entry, servicing, and maintenance.

a. Standard products. The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.

b. Material and equipment schedule. As soon as practicable and within 30 days after the date of award of contract and before commencement of installation of any material or equipment, a plan and necessary elevations of the equipment-room layout showing the proposed air-conditioning equipment, ductwork, etc., with clearances, together with a complete schedule of the material and equipment proposed for installation shall be submitted for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. In the event any items of materials or equipment contained in the schedule, or the plan and elevations of the mechanical-equipment room, fail to comply with the specification requirements, such items or layout arrangement may be rejected.

c. Shop drawings. As soon as practicable after award of contract and prior to installation, complete shop drawings of the piping layout, showing all refrigerant, water, and vent lines, shall be submitted to the Contracting Officer for approval.

d. Capacity information. Prior to installation, the contractor shall furnish the Contracting Officer with manufacturer's published capacity information, including tables, curves, and other data that may be required in order to determine the capacity of the condensing equipment under the design conditions indicated on the drawings.

17-04. MATERIALS AND EQUIPMENT: The following materials and equipment shall conform to the requirements specified below:

a. Evidence shall be furnished that there is an efficient service organization which regularly carries a stock of repair parts for the air-conditioning equipment proposed for installation and that the organization is conveniently located for prompt service.

b. Mechanical equipment. Major items of mechanical equipment shall be of the best quality used for the purpose in commercial practice, and shall be the products of a reputable manufacturer. Each major component of the equipment shall have the manufacturer's name, address, and catalog number on a name plate securely affixed in a

conspicuous place. The name plate of a distributing agent only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

17-05. WORKMANSHIP: Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

17-06. PREVENTION OF RUST: All surfaces of ferrous sheet metal not otherwise specified shall be given a rust-inhibiting treatment. Special care shall be given to the inner surfaces of the steel cooling tower. Unless otherwise approved by the Contracting Officer, the rust-inhibiting treatment shall consist of hot-dip-galvanizing after fabrication, or bonderizing followed by the application of a suitable rust-inhibiting primer and finish paint.

17-07. GENERAL DESCRIPTION: The air-conditioning system shall consist of a self-contained air-conditioning unit, having a cooling tower, together with the necessary ductwork, piping and controls. The air-conditioning equipment and installation shall conform to Japanese Engineering Standards and to the American Society of Refrigerating Engineers' Standard No. 15 and shall be installed as shown on the drawings.

17-08. COMPRESSOR UNITS: The compressor unit shall be a reciprocating or rotary type, with electric-motor drive, motor starter, scale trap, strainer, suction and discharge valves, suitable means of determining oil level, and all necessary accessories. The compressor shall be of vertical, V, or radial design, suitable for use with Freon 12 or Freon 22 refrigerant. The compressor capacity based on the specified suction and discharge conditions shall be not less than indicated on the drawings. Compressor speeds shall not exceed those for which they are designed and indicated on standard rating sheets. The compressor shall be either directly or indirectly connected to the driving electric motor. Compressor motors shall be a suitable induction type with continuous-duty rating, and shall operate with low starting current and high starting torque, unless automatic unloading is provided for starting, in which case the motors may be a normal-torque, low-starting-current type. The V-belt drives shall be designed for at least 50-percent overload capacity. Motor starters shall be magnetic, across-the-line type equipped with thermal-overload protection.

17-09. CONDENSERS employed in self-contained air-conditioning units shall be a water-cooled type.

a. Water-cooled condenser shall be of the shell-and-tube or shell-and-coil type, and may also serve as a receiver if standard with the manufacturer. The condenser shall consist of a cast-iron or

steel shell with finned copper-alloy tubes. Fins shall be securely bonded to the tubes. Condenser capacity shall be not less than indicated on the drawings, and shall be adequate to condense the vaporized refrigerant, when delivered with 10° F. superheat, and when supplied with condensing water from a cooling tower operating in an atmosphere with wet-bulb and dry-bulb temperature as indicated on the drawings. The condenser shall be equipped with necessary accessories such as fittings and valves.

17-10. RECEIVER: The liquid receiver shall be constructed of steel, with welded seams. The inner surfaces shall be thoroughly cleaned by sand blasting or by other suitable means. The receiver shall be supported and shall be equipped with inlet, outlet, drain, charging valve, and safety connections. The liquid receiver shall have a storage capacity of not less than 25-percent in excess of that required for the fully charged system.

17-11. COOLING TOWER shall be of the water turbine-driven fan type, in which the fans are direct connected and driven by water turbines. The turbine head shall be of cast journal bronze, and shall be statically balanced to give a smooth vibrationless motion. The turbine bearing post shall be of corrosion resistant copper nickel alloy tubing, centerless ground for smooth, quiet operation. The cooling tower shall have a capacity not less than indicated on the drawings. The cooling tower shall be complete with structure, casing, water connections, air inlet and discharge openings. The air inlets shall be provided with screens constructed of 1/2-inch mesh galvanized-steel hardware cloth, securely attached. Wood deck filling, shall be either seasoned cypress or heart redwood. Removable panels shall be provided for easy access to all parts for servicing and maintenance. Where steel is employed in the construction of the tower, the casing shall be not less than 0.0747 inches in thickness (14 gage), the louvers shall be not less than 0.0359 inches in thickness (20 gage), and the water tank shall be not less than 0.1046 inches in thickness (12 gage). All steel surfaces contained in the cooling tower shall be given a rust-inhibiting coat as hereinbefore specified. The float valve shall be heavy duty of bronze body and shall have a replaceable disc. The float shall have a heavy wall of spun copper. The cooling tower shall be the standard products of the Carrier Corporation No. 22E-12 or approved equal.

17-12. COILS shall be of the extended-surface type, arranged in a rectangular form to suit the space requirements within the cabinet for the air handling unit. All coils shall be properly supported by means of suitable frames constructed of galvanized-steel angles, or other approved devices.

a. Cooling coil shall be constructed entirely of non-ferrous alloys with the fins securely bonded to the tubes. The coil shall be designed and serpentine for freon as the refrigerant in

accordance with design conditions. An equalizing liquid distributor header shall be used to assure equal distribution under varying load conditions. The cooling coil shall be tested pneumatically and proved tight under a gage pressure of 300 psig. The cooling coil shall be dehydrated and sealed at the factory. The cooling coil shall be provided with a suitable condensation gutter and a drainage line installed as indicated on the drawings or as directed by the Contracting Officer. The cooling coil shall have sufficient surface to provide the capacity indicated on the drawings under the specified operating conditions.

17-13. CIRCULATING FANS: Fans shall be of the centrifugal multi-blade type. Each fan unit shall have an air capacity not less than that indicated on the drawings when operating against the static pressure indicated. Each fan unit shall be installed complete with electric motor and drive equipment. The fans shall be rated and constructed in accordance with the requirements of Japanese Engineering Standards. Fans shall be statically and dynamically balanced at all speeds. Each fan shall be provided with two or more self-aligning and self-oiling bearings with adequate oil reservoirs. The fan shafts shall be made of steel, and shall be provided with key seats and keys for the impeller hubs and fan pulleys or with other equally positive fastening approved by the Contracting Officer. V-belt drives shall be designed for at least 50-percent overload capacity. If required, fan outlets shall be equipped with removable angles and bolts for attaching canvas connections. Each fan motor shall also be provided with a magnetic starter with thermal-overload protection and with a manual push-button station installed in the location shown on the drawings.

17-14. AIR FILTERS: Sectional air filters of the permanent, viscous, washable type, shall be installed in the air conditioning cabinets in such manner as to filter both fresh and recirculated air. The filter sections shall be a standard commercial size, 2 inches in thickness and shall have a resistance when clean not in excess of 0.125 inch of water when handling 2 cu. ft. of air per minute per square inch of face area. The dirt-holding capacity of each unit, when the static pressure drop through the filter becomes 0.25 inch of water, shall be not less than 370 grams. The filter sections shall be composed of an all-metallic filter medium enclosed in a suitable frame. All materials used in the construction of the filters shall be rust, resistant.

17-15. CABINETS: The self-contained air-conditioning unit shall be housed in a casing, constructed of steel sheets of not less than 0.0478 inch in thickness (18 gage). The cabinet shall be adequately reinforced and stiffened with steel angles or other structural members,

and shall be provided with all necessary interior panels supports for equipment, access openings dampers and insulation. All openings in the cabinet which are connected to ducts shall be equipped with removable angles and bolts for attaching canvas or other flexible connections. All interior surfaces of the cabinet shall be rendered rust-resistant in the manner hereinbefore specified. The cabinet shall be insulated on the inside with not less than 1/2-inch of moisture resistant, moldproof, varmin-proof, and termite-proof insulation. Removable panels in the casing shall provide easy access to all parts for lubrication and servicing.

17-16. SELF-CONTAINED AIR-CONDITIONING UNITS: The self-contained air conditioning unit of floor type, as indicated on the drawings, shall be installed where shown. The unit shall have a capacity not less than that indicated on the drawings and shall consist of a cabinet containing the compressor, condenser, coils, filters, fans, motors and controls and provided with all necessary air inlet and outlet openings. The cooling coils and sprays shall be provided with a suitable drip pan constructed of sheet steel not less than 0.0478 inch in thickness (18 gage) with rust-resistant coating as hereinbefore specified. A drain line from the drip pan shall be run as shown or as directed by the Contracting Officer. The cabinet, coils, compressor, condenser, fans, filters, receiver, strainers, piping, and expansion and service valves used in the self-contained air conditioning unit shall conform to the requirements of the applicable paragraph herein. The unit shall have a completely assembled control panel consisting of across the line type starters with thermal-overload relays of the conditioner fan, motor, condensing fan motor and compressor motor, high-and-low pressure cutout, oil pressure safety control and one recycling control relay. The unit shall be the standard products of the Carrier Corporation No. 50 K12 and Westinghouse Model RW 2003.

17-17. PRESSURE GAGES shall be installed on both the high- and low-pressure sides of each compressor, and elsewhere, if required for the proper operation of the air-conditioning system. The gages shall be Bourdon-tube type with dial diameters not less than 4-1/2 inches and operating ranges as follows:

High side - - - - - 0 to 300 p.s.i.

Low side - - - - - 30-inch vacuum to 150 p.s.i.

Pressure gages shall have iron cases with a baked-enamel finish. A suitable shut-off cock shall be installed in the line the each gage.

17-18. REFRIGERANT STRAINERS shall be installed in the refrigerant line on the inlet side of each thermostatic expansion valve and each solenoid valve. Strainers installed in conjunction with expansion valves may be an integral part of the expansion valve. Independent strainers shall be provided with brass or cast-iron bodies designed for a working pressure of 250 p.s.i. with strainer baskets constructed of noncorrodible sheet metal with small perforations of sufficient number to provide a net free area through the basket at least 10 times that of the liquid refrigerant line. The basket shall be removable for cleaning without breaking the inlet and outlet connections.

17-19. SCALE TRAP shall be installed in the suction connection to each compressor unless the compressors have built-in traps. The scale-trap bodies shall be constructed of cast iron, and the screens shall be made of sheet brass or other suitable material. Independent scale traps shall be designed to permit cleaning without breaking the inlet or outlet refrigerant connections.

17-20. VALVES: Valves required for the proper operation and servicing of the air-conditioning system, including solenoid valves, expansion valves, back-pressure valves, steam valves, and service an integral part of the equipment, additional valves serving the same purpose will not be required.

a. Solenoid valves. The solenoid valves shall be designed for the operating pressure, and the valve capacity, as listed in manufacturer's catalog shall be sufficient for the requirements of the air-conditioning unit.

b. Expansion valve of the proper capacity shall be installed in the refrigerant supply line to each evaporator. The valve shall be of the diaphragm or bellows type with external superheat adjustment set for 10° F. superheat.

c. Service valves shall be installed where indicated on the drawings, where specified, or where required for the proper servicing of the equipment. Refrigeration valves shall be installed in the suction and discharge lines adjacent to each compressor unless built-in valves are furnished, the suction line near each evaporator and in the liquid line on the discharge side of each receiver. The refrigerant valves shall be designed for use with Freon and shall be provided with seal caps, unless otherwise approved. The water-supply line to cooling tower shall be provided with a brass globe or gage valve of the same size as the pipe line.

17-21. HIGH-PRESSURE SAFETY CUT-OFF: An automatic high pressure safety and cutoff switch shall be provided for each condensing unit, and shall operate to stop the compressor whenever the pressure within the condenser exceeds the pre-determined safe limit. The cutoff switch shall be a type requiring resetting.

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17-22. THERMOMETERS: Thermometers of the separable-socket type, with not less than 5-inch scales and stems of appropriate length for indicating representative temperature, shall be installed in the ducts where indicated on the drawings or where specified. The thermometers shall have suitable operating ranges and shall be installed so as to be conveniently read.

17-23. AUTOMATIC CONTROLS: Automatic controls shall be as indicated on the drawings or as specified and shall be the electric type. Unless otherwise approved by the Contracting Officer, the entire automatic control equipment shall be standard catalog products of a single reputable manufacturer. Before the air-conditioning installation is accepted, the contractor shall deliver to the Contracting Officer a statement from the manufacturer or his authorized agent, certifying that the automatic control equipment has been inspected and found to be properly installed and functioning satisfactorily. The inspection shall be at the contractor's expense with no additional cost to the Government.

17-24. REFRIGERANT: Refrigerant employed in the air-conditioning system shall be Freon 12 or Freon 22. Each system shall be completely charged with refrigerant, after which it shall be tested and proved tight at all joints. Each air-conditioning system shall be subjected to the operating tests hereinafter specified. Upon satisfactory completion of the tests, any refrigerant which has been lost from the system shall be replaced.

17-25. LUBRICATING OIL: The contractor shall furnish two complete charges of lubricating oil for each compressor crankcase. The oil shall be of type recommended by the manufacturer of the equipment. One charge shall be used during the testing period, and upon the satisfactory completion of the tests, the oil shall be drained and replaced with the second charge.

17-26. PIPING: Refrigeration system and water piping shall be complete, and water piping shall include connections to the cooling tower as well as piping between outlets indicated on the plumbing drawings and the respective float valves and sprays. Refrigerant pipe sizes shall conform to the Equipment Standards of the Air Conditioning and Refrigerating Machinery Association, Inc. USA, except that Freon suction risers shall be sized for a gas velocity not less than 2,000 feet per minute. Flexible connections of a type approved by the Contracting Officer shall be provided at equipment which is mounted on resilient supports.

a. Pipe and tubing. Refrigerant lines shall be seamless copper tubing suitable for a working pressure not less than 300 psig, or standard weight black steel and steam pipes shall be standard weight black steel pipes.

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b. Fittings. Fittings for copper refrigerant lines shall be wrought copper or brass, shall be suitable for use with high temperature solder, and shall be designed for a working pressure of 300 psig. Fittings for steel refrigerant lines shall be a forged steel welding type suitable for the steel pipe used. Fittings for water and steam piping shall be standard weight malleable iron, designed for a working pressure of 150 psig, and shall be threaded. Joints in water pipes shall be made tight with graphite and oil or equal applied to the pipe threads only.

17-27. DUCTWORK: All ductwork shown on the drawings, specified, or required for the air-conditioning system shall be constructed and erected in a first-class, workmanlike manner. Ductwork shall be fabricated or zinc-coated iron or steel sheets. All ducts, unless otherwise directed by the Contracting Officer, shall conform accurately to the dimensions indicated on the drawings, and shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be securely anchored to the building in an approved manner, and shall be installed so as to be completely free from vibration under all conditions of operation. Air turns shall be installed in all abrupt elbows. The air turns shall consist of curved metal blades or vanes, arranged so as to permit the air to make the abrupt turn without appreciable turbulence. Air turns shall be the manufacturer's standard products, and shall be quiet and free from vibration when the system is in operation. Sheet-metal ducts shall be properly braced and reinforced with galvanized steel angles, or other structural members approved by the Contracting Officer. The internal ends of all slip joints shall be installed in the direction of flow. The weights of the sheet-metal ducts and stiffeners shall be as shown in Table 1 and 2.

TABLE I - WEIGHTS AND GAGES FOR DUCT METAL

Longest Dimension of Rectangular Ducts or Diameter of Round Ducts (Inches)	Weight (Pounds Per Square Foot)	Galvanized Steel	Thickness of
		Sheet Gage Number	Aluminum Sheet (Inch)
Up to 12	0.90625	26	0.025
Over 12 to 30	1.1562	24	0.032
Over 30 to 42	1.4062	22	0.040
Over 42 to 60	1.6562	20	0.051
Over 60	2.1562	18	0.064

TABLE II - STIFFENERS FOR DUCTS

Surface Width or Height of Ducts (Inches)	Steel Angle Stiffeners Size (Inches)	Center Spacings (Inches)	Weight of Angle (Pounds Per Foot Before Galvanizing)
Up to 18	Not required		
Over 18 to 36	1 x 1 x 1/8	48 to 60	0.80
Over 36 to 54	1 1/2 x 1 1/2 x 1/8	48 to 60	1.01
Over 54 to 72	1 1/2 x 1 1/2 x 3/16	48 to 60	1.80
Over 72 to 96	2 x 2 x 3/16	48 to 60	2.44
Over 96	2 1/2 x 2 1/2 x 1/4	48 to 60	4.10

17-28. DUCT HANGERS: All duct work shall be supported and/or suspended by 1/4-inch rods attached to 1" x 1" x 3/16" galvanized steel angles mounted on the bottom of the ductwork.

17-29. DAMPERS:

a. Multilouvered and splitter dampers. Multilouvered dampers shall be installed where indicated on the drawings, and shall be constructed of zinc-coated iron or steel sheets weighing not less than 1.6562 pounds per square foot (20 gage), or of other suitable materials approved by the Contracting Officer. Dampers shall be reinforced to prevent vibration, and shall be equipped at both ends with bearings. Each damper shall be close fitting, and unless automatic in operation shall be provided with an adjustment quadrant and locking device. Dampers shall be designed to offer a minimum of resistance to the flow of air.

17-30. AIR VOLUME EXTRACTOR AND CONTROLLER: Air volume extractor or controller shall be installed at the locations as shown on the drawings. The controllers shall be the standard products of the manufacturers. They shall be capable of moving from full open to full close positions bringing even distribution to entire auxiliary duct or grille. The controllers shall be provided with an adjustment quadrant and locking device. The controllers shall be rattle free and shall be made of 14 and 26 gage steel.

17-31. FLEXIBLE CONNECTIONS: Unless otherwise indicated on the drawings, or otherwise specified, flexible connections shall be provided between the air-conditioning units and the ducts with which they are connected. The flexible material used shall be close-weave canvas cloth 16 ounces per square yard and shall be treated or impregnated so as to be rendered practically airtight. Necessary angles, bolts, clips or other fastening for securing the flexible material to the air-conditioning units or fans and adjoining ducts shall be furnished.

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17-32. REGISTERS AND GRILLES shall be installed where indicated on the drawings. Unless otherwise specified, air-supply grilles shall be of the air-conditioning type, with adjustable directional vanes for obtaining the desired air distribution. Each supply grille shall have a net free area as indicated in the schedule on the drawings, and in no case less than 70 percent. Exhaust registers and grilles shall be either of the air-conditioning type, unless specifically described on the drawings, and shall have dimensions and net free areas as indicated. No exhaust grille or register shall have a net free area less than 60 percent. Adjustable volume dampers installed back of the grille or register face shall be as hereinbefore specified. Key-operated dampers shall be provided where indicated on the drawings. Registers and grilles shall be standard catalog products, and shall be given a rust-inhibiting primer at the factory.

17-33. DUCT INSULATION: Unless otherwise shown or specified on the drawings, all supply and return ducts shall be insulated with not less than 1-inch of block type impregnated mineral wool, glass-fiber or other equally suitable material approved by the Contracting Officer. The insulating material shall be set in suitable asphalt or other water-repellent cementing substance that will provide an effective vapor barrier and prevent condensation of moisture on the outer surfaces of ducts. All insulation exposed within equipment rooms or other room where it may be subject to damage shall be protected by means of a suitable coating of hard-finish cement plaster not less than 1/4-inch thickness, applied directly on the insulating board on wire mesh, as approved by the Contracting Officer. All insulation shall be applied by a method recommendation by the manufacturer, and shall be approved by the Contracting Officer.

17-34. PAINTING AND FINISHING: Ferrous metal work not specified to receive finish painting shall be thoroughly cleaned and given one coat of asphalt varnish. Ferrous metal specified to receive finish painting shall be primed and given two coats of oil base paint. Finish painting as specified under "Painting - General" of these specifications.

17-35. ELECTRICAL WORK: Manual or automatic control and protective or signal devices required for the operation of the air-conditioning equipment herein specified but not shown on the electrical plans, shall be furnished and installed under this section of the specifications. Wiring required for the operation of the air-conditioning equipment but not indicated on the electrical plans shall be furnished and installed under electrical section of the specifications, in accordance with "Electrical Work, Interior" of these specifications.

17-36. OPERATION AND MAINTENANCE INSTRUCTIONS: Printed instructions, covering the operation and maintenance of each major item of equipment

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shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, a competent engineer shall be provided by the Contractor for a period of not less than 3 days to instruct a representative of the Government in the operation and maintenance of the air-conditioning systems.

17-37. TESTS: Upon completion of the air-conditioning system installation, and at time designated by the Contracting Officer, all water and refrigerant piping shall be pressure-tested for leaks as hereinafter specified. All water piping shall be tested hydrostatically and proved tight under a gage pressure of not less than 1-1/2 times the maximum operating pressure. All refrigerant piping shall be tested pneumatically with CO₂ or dry air and proved tight by swabbing with a soap solution, or other equally effective means. The high side of each refrigeration system shall be tested at 300 psig and low side at 150 psig. After evacuating the system and charging it with refrigerant, the piping shall be tested with a halite torch and proved tight under actual operating conditions. After the above tests have been completed, and before each system is accepted, capacity and general operating tests on the air-conditioning system shall be conducted by a competent and experienced engineer, and the tests shall demonstrate the specified capacities of the various pieces of equipment. A direct-reading velocity instrument that has been recently tested and calibrated shall be used to show that the air flow in the various ducts has been so regulated as to deliver or remove the required cubic feet of air per minute at each supply and exhaust opening respectively. The tests shall be conducted in the presence of the Contracting Officer or his authorized representative. The general operating tests shall cover a period of not less than 12 hours for each system, and shall demonstrate that the entire equipment is functioning in accordance with the specifications and to the entire satisfaction of the Contracting Officer. The contractor shall furnish all instruments test equipment, and personnel that are required for the tests and the Government shall furnish the necessary fuel, water and electricity.

SECTION 18. ELECTRICAL WORK, INTERIOR

18-01. GENERAL REQUIREMENTS: The work covered by this section consists in furnishing all labor, equipment, supplies, and materials, and in performing all operations, including cuttings, channeling, and chasing, necessary for the replacing of complete interior wiring system, electrical service connections, in strict accordance with this section of the specifications and the applicable drawings.

18-02. APPLICABLE SPECIFICATIONS AND STANDARDS: The following specifications form a part of this specification and shall be the latest issue in effect at date of invitation for bids.

a. Japanese Industrial Standards.

C-8304	Small Switches for Indoor Use
C-8305	Electric Conduits (Steel)
C-8309	Flexible Electric Conduit for Electric Wiring
C-8314	Cartridge Fuses and Holders
C-8332	Bushings for Steel Conduit
C-8336	Outlet Box for Conduit Pipe
C-8339	Box Cover for Conduit Pipe
C-8340	Circular Surface Boxes for Steel Conduit
C-8341	Surface Switch Boxes for Steel Conduit
C-8343	Connectors (for Conduit Tube)
C-8346	Grounding Clamps and Bushings for Bolders
C-8370	Circuit Breaker for Wiring

18-03. GENERAL: Before removal work is started, prior permission of the Contracting Officer shall be obtained in writing. The installations shall comply with the applicable rules of the National Electric Code or equivalent Japanese work codes. All electrical materials shall be new and shall comply with the applicable Japanese Industrial Standards and other recognized codes. Defective equipment or equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting with the approval of the Contracting Officer. The contract drawings indicate the extent and general arrangement of the conduit and wiring systems. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable, and within 30 days after award of the contract, to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer.

a. Standard products. Unless otherwise indicated in writing by the Contracting Officer, the materials to be furnished under this

specification shall be the standard products of manufacturer regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

b. Materials and equipment schedules. As soon as practicable and within 30 days after the date of award of contract and before any material or equipment is purchased, the contractor shall submit to the Contracting Officer for approval a complete list, in triplicate, of materials, fixtures, and equipment to be incorporated in the work. The list shall include catalog numbers, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturer's published ratings. Any materials, fixtures, and equipment listed which are not in accordance with the specification requirements may be rejected.

18-04. GROUNDING: The conduit systems and neutral conductor of the wiring system shall be grounded. The ground connection of the electric-system neutral and conduit system shall be made at the main circuit breaker panel. A bare copper ground conductor, correctly sized and in no case smaller than No. 8 Awg., shall be extended in conduit or tubing from the main service equipment to the point of entrance of the water service. Connection to the water pipe shall be made by a suitable ground clamp or lug connection to a plugged tee. If flanged pipes are encountered, connection shall be made with the lug bolted to the supply side of the flange connection. The ground shall serve for both the electric and equipment ground. The bonding conductor may be either of flat-strip or round copper, in one piece if practicable, secured with bolted connections. The grounding system shall be installed in a workmanlike manner and shall be inconspicuous.

18-05. WIRING: Branch-circuit conductors shall be not smaller than No. 12 Awg., and conductors for branch circuits whose length from panel to center of load exceeds 100 feet shall be not smaller than No. 10 Awg. Conductors for signal and pilot control circuits may be No. 14 Awg. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Junction boxes may be utilized where required. Wire connectors of insulating material or solderless pressure connectors, properly taped, shall be utilized for all splices in wiring where possible. Soldered joints insulated with tape shall be kept to a minimum. Rubber and friction tape shall be first quality. Vinyl plastic type will be acceptable in lieu of rubber and friction tape. Branch circuit maximum voltage drop shall be 2% for lighting and 3% for power. Maximum voltage drop for feeders from entrance point to panel board shall be 1% for lighting and 2% for power.

a. Conduit and tubing systems. Conduit and tubing systems shall be installed in accordance with the applicable provisions of the Japanese Electrical Standards. Rigid steel conduit shall be zinc-coated

and shall conform to the requirements of JIS C-8305-32-33. Electrical metallic tubing shall be zinc-coated and shall conform to JIS C-8305. No conduit or tubing smaller than 1/2 inch inside diameter shall be used.

(1) Installation. Conduit and tubing shall be concealed within the walls, ceilings, and floors, where possible, and shall be kept at least 6 inches from parallel runs of steam pipes, or hot water pipes. In no case shall tubing be installed in concrete. Exposed runs of conduit or tubing shall have supports spaced not more than 8 feet apart and shall be installed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical bends. Joists, rafters, studs, and/or other framing members shall not be notched. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit-bending machine. Conduit or tubing which has been crushed or deformed in any way shall not be installed. Expansion fittings or other approved devices shall be used to provide for expansion and contraction where conduit or tubing crosses expansion joints. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure supports. Conduit and tubing shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of expansion bolts in concrete, machine screws on metal surface, and wood screws on wood construction. Nails shall not be used as the means of fastening boxes or conduits. Conduit and tubing shall be installed in such manner as to insure against trouble from the collection of trapped condensation, and all runs of conduit shall be arranged so as to be devoid of traps wherever possible. Contractor shall exercise the necessary precautions to prevent the lodgment of dirt, plaster, or trash in conduit, tubing, fittings, and boxes during the course of installation. A run of conduit or tubing which has become clogged shall be entirely freed of these accumulations or shall be replaced. Conduit and tubing shall be securely fastened to all sheet-metal outlet, junction, and pull boxes with connectors or galvanized locknuts and bushings. One locknut shall be placed outside the box and one inside, after which both shall be drawn tightly enough to assure firm electrical contact with the box. Care shall be taken to see that the full number of threads project through to permit the bushing to be drawn tight against the end of conduit. Full wiring only shall be installed in telephone system conduits.

(2) Conductors. A complete system of conductors shall be installed in the raceway systems. Conductors installed in ordinarily dry locations shall be rubber-insulated, or thermoplastic-insulated first quality. Conductors installed in wet location such as in direct contact with earth, subject to moisture or condensation shall be rubber-insulated moisture-resistant type or thermoplastic-insulated first quality specifically designed for such application. Home runs may be

combined in one conduit provided all connections are in accordance with the Japanese Electrical Standard requirements and the maximum unbalanced current in the neutral does not exceed the capacity of the conductor. All wire terminals shall be identified at devices, terminal blocks, and panel-boards.

b. Armored cable. Armored cable shall be "DA" cable as manufactured by Izawa Kogyo Co., or approved equal conforming to JIS C-8309.

(1) Installation. Armored cable shall be concealed within walls, and ceilings, where possible, but not embedded in concrete and shall be kept at least 6 inches from parallel runs of steam pipes, or hot water pipes. Armored cable shall be secured by approved straps, staples, or similar fittings, so designed and installed so as not to injure the cable. Concealed cable shall be secured at intervals not exceeding 4-1/2 feet and within 12 inches from every outlet box or fitting. Exposed runs of cable shall closely follow the surface of the building finish or running boards and be secured at intervals not exceeding 2 feet and within 12 inches from every outlet box of fitting. When armored cable is run through bored holes in studs, joists, or similar wood members, holes shall be bored at the approximately centers of wood members, or at least 2-1/2 inches from the nearest edge. Joists, rafters, studs, and/or other framing members shall not be notched. At all points where the armor terminates, a fitting shall be provided and an approved insulating bushing or its equivalent shall be provided between the conductors and the armor. All bends shall be so made that the armor of the cable will not be injured, and the radius of the curve of the inner edge of any bend shall be not less than 5 times the diameter of the cable.

13-06. OUTLETS: Outlets shall be installed in the locations shown on the drawings. The contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that his work may fit the other work required by these specifications. When necessary, the contractor shall relocate outlets so that, when fixtures or other fittings are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment. Only zinc-coated or cadmium-plated sheet-steel boxes conforming to the requirements of JIS C-8336 of a class to satisfy the conditions for each outlet, shall be used in concealed work. Boxes shall be installed in a rigid and satisfactory manner. Fixture outlet boxes on ceilings shall be not less than 4 inch octagonal. Switch, and receptacle outlet boxes shall be not less than 4 inches square, fitted with appropriate plaster covers, where necessary, to set flush with the finished surface. One piece gang boxes not less than 2 inches deep shall be utilized where necessary. Outlets in exposed work shall be of cast steel or alloy fitted with appropriate covers.

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a. Pull boxes. Pull boxes shall be constructed of code-gage galvanized sheet metal, of not less than the minimum size recommended by the Japanese Electrical Standards. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation.

b. Device plates. A device plate shall be provided for each outlet to suit the device installed. All plates on unfurnished walls or on exposed fittings shall be of zinc-coated sheet metal having rounded or beveled edges. All plates on finished walls shall be of brass having a polished finish with plain polished borders. Screws shall be of metal with countersunk heads, with finish to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed vertically and with an alignment tolerance of 1/16 inch. Device plates shall be of the one piece type, of suitable shape for the devices to be covered. The use of sectional device plates will not be permitted.

c. Telephone outlets. Each telephone and/or communication outlet plate shall be provided with a 3/8" hole in the center. metal plates shall have a bushed hole.

18-07. WALL RECEPTACLES:

a. Wall receptacles shall be rated at 10 amperes at 125 volts, 3 pole, 2 wire with the third pole grounded. Bases shall be constructed of brown phenolic composition. Terminals shall be mounted on the sides of the base with two screws per terminal. Mounting straps shall have plaster ears. Heavy duty receptacles shall be of the single type, having capacity to carry the load continuously without damage, and shall be furnished with a suitable cord-grip-cap. Receptacles shall be of the three hole type, with third hole to receive ground.

b. Grounding for convenience outlets.

(1) General. Convenience outlets shall be provided with a grounding pole electrically connected to a suitable grounding conductor.

(2) Methods of grounding. The grounding conductor normally will be an integral part of the electrical system. The system neutral shall not be used for a grounding conductor except where specifically directed in each case. A continuous metallic system, which is suitably grounded may be used as a grounding conductor. The sheath of metallic armored cable connected to metallic and non-metallic sheathed

cable supplying outlets with grounding poles shall have a ground wire inclosed in the sheath. Grounding poles shall be incorporated in the body of the outlets and the arrangement of poles shall be such as to permit the use of a standard two pole attachment cap as well as a three pole cap containing grounding pole. Three phase outlets shall include a grounding pole incorporated in the body of the outlet.

18-08. WALL SWITCHES: Wall switches shall be of the totally enclosed tumbler type and shall conform to the requirements of JIS C-8304. In addition to the spring actuating the switch, the operating mechanism shall include a positive mechanical means to initiate motion tending to close and/or open the circuit. Enclosures shall be of phenolic composition. Not more than two switches shall be installed in a single gang position of a switch box. Single-pole three-way and four-way switches shall be of the tumbler type, rated 10 amperes at 125 volts. All switches shall be suitable for the control of tungsten-filament lamp loads.

18-09. PANEL BOARDS: Panel boards shall be of first grade material and workmanship and shall be of the dead-front safety type and shall be suitable for operation on a 105/210 volt, three-phase, 4 wire, grounded solid neutral system. Panel boards shall be provided with the size and number of single, double or triple pole branches as indicated on drawings. Panel boards shall be provided with lugs only in the mains, except as noted. Circuit breakers shall be of first grade material and workmanship approved by the Contracting Officer.

a. Circuit breaker type. Circuit-breaker-type panel boards shall conform to the requirements of U.S. Federal Specification W-P-131, class 1.

b. Fuse type. Fuse-type panel boards shall conform to the requirements of U.S. Federal Specification W-P-146. Feeder or power-distribution panel boards shall be provided with hinged-door or removable-holder type of combined switch and fuse units. Switch-and-fuse units acting as motor-circuit disconnect switches shall be horsepower rated.

18-10. CABINETS: Cabinet boxes shall be constructed of zinc-coated sheet steel and shall be of first grade material and workmanship. Trims and doors shall have a suitable primer coat and a finish coat of a color specifically designated by the Contracting Officer.

a. Panel board cabinets. Cabinets for panel-boards shall be provided with not less than 4 inch wiring gutters at the sides, top, and bottom. Cabinet heights shall not exceed 72 inches. Cabinets shall be mounted so that the distance from the floor to the center of the top switch or circuit breaker will not exceed 6 feet

6 inches. Flush cabinets shall be provided with trims having adjustable trim clamps. Trims shall be fitted with hinged doors having combination lock and latch. All locks shall be keyed alike. A directory holder with glass plate and metal frame shall be mounted on the inside of each door. A neatly typed directory, properly identifying each circuit, shall be mounted under the glass.

b. Telephone and signal system cabinets. Cabinet box shall be located approximately as indicated on the drawings. Each trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interior. Box shall be provided with 3/4-inch weather-proof-grade plywood backboard having a two-coat insulating-varnish finish.

18-11. FUSES: The contractor shall furnish a complete set of fuses for all fused type switches and panels. Fuses of 30 ampere 125 volt capacity, or less, shall be of the non-renewable type. Fuses in excess of 30 ampere capacity shall be of the renewable cartridge type with links not separately enclosed and shall conform to the requirements of U. S. Federal Specification W-F-803, Type II.

18-12. MOTORS: Motors shall be of sufficient size for the duty to be performed and shall not exceed their fully rated load when the driven equipment is operating at specified capacity under the most severe conditions likely to be encountered. Unless otherwise specified, all motors shall have open frames, class A insulation and continuous-duty classification based on a 40° C., ambient temperature of reference. Motors shall be first grade material and workmanship of Standard Manufacture approved of by the Contracting Officer.

a. Fractional-horse-power motors. Fractional horse-power motors of single-phase alternating-current and universal types shall conform to the requirements of the Japanese Electrical Standards. Motors shall be of first grade material and workmanship approved of by the Contracting Officer.

b. Integral-horse-power alternating-current motors. Integral-horse-power alternating-current motors shall conform to the requirements of the Japanese Electrical Standards and shall be of first grade material and workmanship, approved of by the Contracting Officer. Polyphase motors shall be Class B, squirrel-cage type, having normal-starting-torque and low-starting-current characteristics unless other characteristics are specified elsewhere.

c. Other motors. Motors not included within the scope of paragraph (2) and (b) above shall conform to the design, construction, and performance requirements of the Japanese Electrical Standards and shall be of first grade materials and manufacturer, approved of by the Contracting Officer.

18-13. MOTOR CONTROL: Each motor, or group of motors requiring a single control shall be provided with a suitable controller and devices which will perform the functions as specified for the respective motors in other parts of these specifications. Each motor, 1/8 horsepower or larger, shall be provided with thermal overload protection. The overload protective device shall be provided either integral with the motor or controller, or mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the external manually reset type. Single or double pole tumbler switches may be used as manual controllers for motors of 1/4 horsepower or less in rating. Manual controllers for motors larger than 1/4 horsepower shall be specifically designed for the purpose and shall have a horsepower rating adequate for the motor. Automatic-control devices such as thermostats or float or pressure switches may control the starting and stopping of motors directly, provided they are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot control circuit. When manual-automatic control is specified, a selector switch shall be provided. The selector switch shall be of a 3-position enclosed type, externally operated by one handle and marked "Manual-Off-Automatic".

18-14. MOTOR-DISCONNECT MEANS: Each motor shall be provided with a disconnecting means when required as directed by the Contracting Officer even though not indicated on the drawings. A horsepower rated switch or a conduit breaker in a panel-board will be acceptable as a disconnecting means, if located within sight of the motor controller. A quick-make and quick-break general-use tumbler or snap switch will be acceptable for capacities less than 30 amperes provided the ampere rating of the switch is at least double the rating of the controlled equipment. Switches of 30 to 400 ampere capacity shall be of the enclosed, quick-make and quick-break, horsepower-rated, externally operated, safety type. Switches shall disconnect all ungrounded conductors.

18-15. FIXTURES: Fixtures shall conform to the standard types called for on the lighting fixtures sheet which shall serve as a guide to assist the contractor in selecting the fixtures. The fixtures as finally selected shall be similar in design and equal in quality to those listed and be a standard cataloged item. The actual size of the fixture shall correspond with the wattage listed in the schedule. Before ordering, contractor shall submit to the Contracting Officer for approval a complete list of the fixtures he intends to furnish, showing the manufacture and catalog number for each item. In any case where the catalog does not show a cut of the fixture, a photograph or detail drawing of the fixture showing complete details shall be submitted. All lamp holders shall be of a porcelain material. Fixture wires shall be asbestos and varnished cambric type No. 14 on wattages over 300. Roughing boxes for recessed fixtures shall be galvanized steel. Porcelain-enamelled-steel fixtures shall be of first grade material and workmanship. In general, all hinges

shall be completely concealed and cover fastened with flush pushbutton-type catches. No mounting screws shall be visible when unit is closed and mounted in place. Metal parts on interior fixtures shall be cast brass, 22 gage brass or aluminum spinning or steel stampings. Fitter supporting glassware shall have full beaded edges. Self-aligning joints shall be provided for all fixtures employing hangers, located just below the canopy, of the type which entirely conceals the wiring. This joint shall be fastened to the fixture stud in the outlet box. Canopy shall be provided for each fixture, adjustable, with full beaded edges; shall have a means of support which does not employ visible screws. here installed on concealed wiring work, the diameter shall be of proper size to conceal the outlet box; where installed on exposed wiring, the diameter shall be of proper size to fit the conduit fitting. Finish of metal parts shall be chromium plate, satin finish, unless otherwise noted. All exterior fixtures shall be of types manufactured for outside use.

18-16. FLOODLIGHTS: Floodlights of the size noted shall be installed where indicated on the drawings. Floodlights shall be of the enclosed type equipped with provision for horizontal and vertical adjustment. The housing shall be constructed of a cast corrosion-resisting alloy and shall be dust-tight and weatherproof. The reflector shall be of silvered glass or aluminum and shall be removable from the housing. Aluminum reflectors shall have a polished, permanent, non-tarnishing, reflecting surface, and shall be Alzak, or similar and equal. A gasketed hinged door containing a gasketed clear, smooth, convex, heat-resisting, cover glass shall be held to the housing by a clamping arrangement. Floodlight installations shall include corrosion-resisting mounting brackets of suitable design for the applicable method of mounting. The beam characteristics of floodlights shall be such as to provide a concentrated distribution of light over the area to be lighted, with a minimum of wasted light against buildings and in unused areas. The fixtures shall be those shown on the drawings, or similar and equal.

18-17. EQUIPMENT CONNECTIONS: Equipment connections shall be made with flexible conduit not less than 18 inches in length. Controllers for motors, disconnect switches, and all control, protective, and signal devices for motor circuits, except where such apparatus is furnished mounted and connected integral with the motor-driven equipment, shall be installed, connected, and left in operating condition. The number and size of conductors between motors and control or protective apparatus shall be as recommended by the manufacturer of the apparatus.

18-18. FUEL OIL STORAGE TANK: Fuel oil storage tank for generators shall be of capacity not less than that indicated on the drawings and constructed in accordance with details shown therein. Tanks shall be of steel not less than 3/16 inch thick and provided with welded, reinforced threaded openings or flanges for all pipe connections including oil full, vents and supply and return lines. Concrete saddles shall be provided as shown complete with all bolts and straps. Straps and bolts not embed in concrete

shall be thoroughly coated with coal tar. A calibrated sounding rod shall be furnished with the tank.

18-19. REPAIR OF EXISTING WORK: The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to buildings, piping, or equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Government.

18-20. GUARANTY: The system furnished under this part of the specifications shall be guaranteed for a period of one year from the date of final acceptance thereof against defective materials and workmanship. Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guaranty period, the affected part of parts shall be replaced promptly by and the expense of the contractor.

18-21. TESTS: After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer or his authorized representative. The contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power.

SECTION 19. SECURITY FENCE

19-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials not furnished by the Government, and in performing all operations in connection with the construction of security fence, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

19-02. APPLICABLE SPECIFICATIONS: The following Federal Specifications, of the issues listed below but referred to thereafter by basic designation only, form a part of this specification:

FF-B-571a	Bolts, Nuts, Studs and Tap-Rivets (and Material for Same)
RR-F-183	Fence-Posts, Gates and Accessories
RR-F-191	Fencing, Chain-Link or Welded
WW-P-406	Pipe; Steel and Ferrous-Alloy (for Ordinary Uses (Iron-Pipe-Size)
WW-P-521b	Pipe-Fittings; Malleable Iron (Screwed) 150-Pound

19-03. GENERAL: Gages of wire indicated on the drawings or specified herein shall be Steel Wire Gages and shall be the minimum acceptable. All steel and iron parts shall be zinc-coated. The zinc-coating shall withstand six 1-minute dips of the Preece Test as prescribed by Federal Specification RR-F-183. Fences and gates shall be of the sizes and designs indicated on the drawings.

19-04. MATERIALS:

a. Chain-Link fabric shall conform to Federal Specification RR-F-191, type A, class 1. Fabric shall be 2-inch diamond mesh, 6-gage wire (0.192 inch in diameter).

b. Bolts, nuts and washers shall conform to Federal Specification FF-B-571, zinc-coated.

c. Line, end, corner and gate posts and braces shall be zinc-coated steel pipe conforming to Federal Specification WW-P-406, and shall be of the sizes and lengths indicated on the drawings. The term "corner post" as used herein shall be a post occurring at any deflection angle of the fence in excess of 10 degrees. Precast concrete and H-beam posts shall be as hereinafter specified.

d. Stretcher bars and clips.

(1) Stretcher bars shall be zinc-coated steel not less than 3/16 by 3/4 inch in cross section or equivalent cross-sectional area and shall be of lengths equal to the full height of the fabric with which they are to be used. The stretcher bars shall be arranged

for attaching to the fabric by threading through the fabric, by clamps or by other positive mechanical means.

(2) Clips of adequate strength shall be provided by sufficient number for attaching the fabric and stretcher bars to all posts at intervals not exceeding 15 inches.

19-05. CONSTRUCTION AND INSTALLATION:

a. General. Finished fencing shall be in proper alignment as far as practicable in conformance with the finished grade, with posts plumb and all wire work taut. Care shall be exercised to equalize the tension or pull of the wire on each side of the posts, and all corner and end posts shall be braced as shown on the drawings, or required. All hardware shall be thoroughly secured, properly adjusted and left in perfect working order.

b. Concrete foundation for posts shall be of the sizes indicated on the drawings. Exposed top surface of concrete base shall be bevelled as shown. Concrete shall meet the requirements for Class B concrete under section on CONCRETE, including requirements for materials, proportions, mixing, placing, protection, curing and the furnishing and construction of forms and steel, if any.

c. Chain-link fence:

(1) Posts shall be spaced as indicated on the drawings and shall be set securely in concrete to the depth shown. Posts shall be securely held in position with temporary bracing while placing the concrete for the foundation. Bracing shall not be removed until the concrete has hardened.

(2) Braces shall be accurately fitted, attached to the posts and properly set and welded. Post braces shall be provided for gate, corner and end posts.

(3) Chain-link fabric shall be stretched taut and clipped to each post at intervals of not more than 5 meshes. The top and bottom selvage wire shall be pulled taut and thoroughly secured to end and bottom posts and clipped at intermediate line posts. Fabric shall be attached to each gate and end post by one stretcher bar and to corner post by two stretcher bars. Stretcher bars shall be threaded through the fabric and attached to the posts by clamps or by other approved mechanical means.

d. Gates shall be swing type, complete with latches, stops, keepers, hinges, locks and fabric.

(1) Gate frames shall be constructed of zinc-coated steel pipe, truss rods and turnbuckles, to the details shown on the drawings. All joints between members shall be made by heavy fittings, providing rigid and watertight connections. Truss rods shall be not less 3/8 inch in nominal diameter.

(2) Chain-link fabric shall be as hereinabove specified and shall be attached securely to the gate frame with clips at intervals not exceeding 15 inches.

(3) Hinges shall be of heavy pattern, zinc-coated steel, wrought iron or malleable iron, of adequate strength for the gate and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gate shall be capable of being opened and closed easily by one person and shall be arranged so they may be swung back parallel with the fence.

(4) Latches, stops and keepers shall be provided for all gates, and shall be of zinc-coated steel, wrought iron or malleable iron.

(a) Latches shall be of the plunger-bar type and shall be of the full gate height and arranged to engage the gate stop, except for single gates for openings less than 10 feet wide a forked latch may be provided subject to the approval of the Contracting Officer. Latches shall be arranged for locking.

(b) Stops shall consist of a flush plate with anchor arranged to be set in concrete and to engage the plunger of the bar latch, except that for single gates for openings less than 10 feet wide other approved types of stops may be provided subject to the approval of the Contracting Officer.

(c) Keepers shall consist of a substantial mechanical device for securing and supporting the free end of the gate in the full open position.

(5) Locks for gates shall be of substantial construction, zinc-coated case, and shall be accessible from both sides of the gate. Three keys shall be furnished with each lock.

SECTION 20. INSTALLATION OF GOVERNMENT-FURNISHED EQUIPMENT

20-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with installing Government-furnished equipment, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

20-02. GENERAL: The Government-furnished equipment to be installed under this section is listed complete in Schedule "B".

20-03. INSTALLATION: Unless otherwise specified or directed, all equipment shall be assembled and installed in accordance with the recommendations of the manufacturer. If there are no manufacturer's recommendations for, or if the manufacturer's recommendations are not applicable to certain installations, the installations shall be made in accordance with the best practice known to the trade, unless otherwise directed.

20-04. DAMAGE AND REPAIR:

a. General. The Contractor shall inspect all Government furnished property immediately upon arrival and report any damage or shortage to the Contracting Officer in writing within 24 hours as required by the Special Conditions. Since apparently minor damage may require replacement of an entire piece of equipment or costly repairs thereto, the inspections shall be thoroughly made by competent employees experienced in such work.

b. Responsibility. The Contracting Officer will be responsible for all Government-furnished equipment up to point of arrival, and the Contractor shall be responsible for unloading and thereafter through installation complete, the Contractor shall only be responsible for damage to such equipment caused through his own fault or negligence.

c. Repair. All damaged or broken equipment for which the Contractor is responsible shall be replaced with new equipment unless the Contracting Officer grants permission in writing for the Contractor to make repairs. All repairs, unless otherwise directed, shall be made in accordance with the manufacturer's recommendations.